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The Learning of Children at High Risk for Schizophrenia

by

Renée Garfinkel



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THE LEARNING OF CHILDREN AT HIGH RISK FOR SCHIZOPHRENIA

av

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RISK FOR SCHIZOPHRENIA

by

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Lund, Sweden

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ABSTRACT

THE LEARNING OF CHILDREN AT HIGH
RISK FOR SCHIZOPHRENIA

Renée Garfinkel

I. A verbal discrimination task was devised to study the effects of positive and negative social reinforcement on three groups of subjects: 1) children of a schizophrenic parent -- Experimental; 2) children of a parent with other types of psychopathology -- Reactive; and 3) children of normal parents -- Control. The 36 subjects in each group were between 11 and 13 years old; half of each group was male, and half female. The subjects were matched on relevant variables.

The results indicate that the subject's sex, and the existence of any psychopathology in his parent, is of greater importance in determining his response to censure than the particular diagnosis of his parents. Experimental and Reactive females learned slowly under negative reinforcement, while the males in both groups learned quickly. There was no difference in the speed of learning in the male and female Controls; their performance was in between the extremes of the other two groups.

Experimental and Reactive females, and Control males showed significant improvement from the negative to the positive reinforcement condition. However, because of contamination by the order effect,

the amount of improvement due to reinforcement and the amount due to practice could not be determined.

A sex effect was not found in the I.Q. (WISC) scores of the subjects. Thus, it was reinforcer effectiveness, and not intelligence, that was observed.

The experimenter's impressions of S were measured with an Adjective Checklist and were found to be related to S's performance. The three groups who learned most poorly in the negative condition, and who showed the greatest improvement in the positive condition (Experimental and Reactive females, Control males) were described by E with adjectives indicative of openness and sensitivity to the environment. He perceived them as affected by the environment and that is the way they behaved -- learning was disrupted by punishment and was enhanced by reward.

The results of this investigation call for the need for control groups of other mental disorders in schizophrenia research, as well as the need to focus attention on the variable of sex in psychopathology research. Since the pathologic males and females performed at opposite extremes in this study, it is clear that generalization from experiments with one sex only are unacceptable and may be misleading.

II. A social worker's interview of children at high risk for schizophrenia and children at low risk for schizophrenia was analyzed. Only 14 out of 120 items differentiated the groups; these indicated poor interpersonal relationships (friends and family alike), poor communication, and the presence of anxiety in the high-risk group.

The interviews of 20 "sick" high-risk subjects, as well as those of their matched well-functioning, high-risk controls, and 20 low-risk controls, were examined for the record of important life

3.
events (pleasant or unpleasant) reported for the three groups in the year preceding breakdown in the sick subjects, or in the year of breakdown.

It was noted, however, that since the interviewer had not been systematically seeking information about important events, but merely noted them as they came up during the interview, the data was not complete.

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Erratum

Page-number 45 is lacking. The text proceeds from p. 44 directly to p. 46.

Chapter I

INTRODUCTION

The group of schizophrenias is the single largest and most serious diagnosis in the psychiatric realm. They are the most debilitating of psychiatric disorders, filling the largest number of mental hospital beds and causing untold misery for the victims and their families. The causes of schizophrenia have baffled scientists even as its cure has eluded physicians. What is schizophrenia? Even that simple question can only be answered in a complicated, qualified way, with no consensus among authorities. The syndrome of schizophrenia includes such a wide range of disturbances, both in varying areas of functioning and in the spectrum of behaviors manifested, that concise definitions cannot be well formulated. The American Psychiatric Association (DSM II, p. 33) offers the following general definition of the schizophrenic reaction:

This large category includes a group of disorders manifested by characteristic disturbances of thinking, mood and behavior. Disturbances in thinking are marked by alterations of concept formation which may lead to misinterpretation of reality and sometimes to delusions and hallucinations, which frequently appear psychologically self-protective. Corollary mood changes include ambivalent, constricted and inappropriate emotional responsiveness and loss of empathy with others. Behavior may be withdrawn, regressive and bizarre.

This definition gives us some idea of the complexity and comprehensiveness of the schizophrenic disorder. Not all disturbances are evident in

every case at all times, but whatever behavior the schizophrenic manifests has the quality of being "out of touch" with reality, or inappropriate. "Inappropriateness" of behavior covers such a wide variety of responses that behaviors at opposite ends of the continuum can be subsumed under the label of schizophrenia. For example, apathy is characteristic of simple schizophrenia. In that case "apathy" denotes a generally reduced psychobiological level of functioning, with little expression of emotion, low aggression, and little interaction or attachment to the external world. The behavior of the hebephrenic, on the other hand, is at the opposite extreme. In the hebephrenic type of schizophrenia motor activity and affect are high and labile. The hebephrenic is constantly changing, posturing, and performing various rituals. He laughs, cries, and grimaces. But the hebephrenic's activity, affect, and interactions are inappropriate to the situation, and therein lies the similarity with the other subtypes of schizophrenia. It is the general quality of retreat, withdrawal, or loss of contact with reality that stamps the behavior "schizophrenic." However, the changing nature of schizophrenic behavior, as well as the multiplicity of symptoms and degrees of severity make for imprecision and conflict in the diagnosis of the disorder.

The lack of consensus as to what constitutes schizophrenia and precisely which behaviors are necessary and sufficient for its diagnosis is probably a fundamental cause of the confusion and contradiction in the research literature. Much theoretical and research attention has been given to the problem of schizophrenia, but the empirical work is replete with conflicting findings and

failures to replicate results. The research in schizophrenia has come from diverse areas of scientific pursuit, but they are not just fragmented, isolated, and unrelated investigations into the same phenomenon. A multi-faceted phenomenon like schizophrenia can be investigated on many levels, and the respective approaches can be viewed as complementary. If schizophrenia is perceived as behavior developing over time, the complementary nature of diverse research approaches becomes clear. Genetic studies indicate the likelihood of a predisposition to schizophrenia within families. The need for biological studies follows logically with their search for the physiological and biochemical abnormalities which could be instrumental either in the predisposition to schizophrenia or in the schizophrenic reaction itself. The various interpersonal approaches represent a still further step in a developmental orientation to schizophrenia research. In the most general terms, studies of an interpersonal nature examine the psychosocial milieu in which schizophrenia develops and exists. What stresses, family dynamics, modes of communication or learning patterns can be implicated in the development of schizophrenia? The body of interpersonal studies in schizophrenia can be viewed as asking the question, "In what way are social processes involved in the development and maintenance of schizophrenic behavior?"

The central role played by social processes and interpersonal relationships in early child development cannot be overemphasized. Theoretical and empirical work have both stressed the importance of social interaction for the healthy development of the child. Basic orientation to the world (Erikson's basic trust versus distrust, 1964)

as well as language, motor skills, ego and sexual identity and social competence grow and develop within a context of interpersonal relationships. Proper development occurs within a social context and is contingent upon it. Selective approval and disapproval or social reward and punishment are a primary mechanism for the growth and maintenance of life skills. The individual learns to make discriminations and learns to respond appropriately, i.e., at the right time and place and with the appropriate frequency and intensity, through the system of social reward and punishment. When that system goes awry, faulty learning and inappropriate behavior can result.

It is the inappropriateness of the schizophrenic's behavior that draws our attention. The schizophrenic appears to be responding to cues which we consider irrelevant, and to be ignoring the cues or stimuli which are germane. His conversation, for example, is inappropriate because we, the listeners, cannot follow it. It fails to follow our rules of logic, is tangential, and can include irrelevant details and nonsense words. The peculiar associations between words and ideas in the schizophrenic's conversation are inappropriate to the situation, i.e., it is out of touch with reality. Other areas of schizophrenic function -- affect, behavior, cognition, sensation, and perception -- are similarly removed from reality or inappropriate.

A behavior pattern of inappropriate responding can be conceptualized as developing through faulty learning. The processes of social learning that generally nurture normal development seem to have gone wrong and have resulted in an individual who is under the control of reinforcing stimuli different from the norm, or who does not

make the necessary discriminations (responds to irrelevant cues, ignores the relevant ones, responds to an aspect of one situation as if another were present in its totality, etc.), or for whom inappropriate behavior has been periodically reinforced, or, perhaps, self-reinforced. The abnormal behavior resulting from any of these conditions can be viewed as developing "normally," i.e., according to the lawful principles of learning and conditioning.

Although we don't understand all the processes involved in early learning, there are some that we can observe. The child's first vocalization of something approximating "daddy" in the presence of his father is met with smiles, hugs, and the expressions of pleasure likely to increase the probability of the "daddy" sound being emitted again. All this pleasant social reinforcement is not forthcoming when the infant says "daddy" to the postman. The child eventually learns to make the discrimination. But what might happen if the baby were not affected by social reinforcement? -- if he did not feel pleasure at being fondled and kissed? Certainly his learning of the discrimination between "daddy" and other men would be impeded. Let us go a step further and consider what would happen to an infant who is hypersensitive to stimulation. He might be frightened by the noisy expressions of pleasure and pride at his first word and be upset by the jostling of hugs and kisses. The aversive nature of the reinforcement for this child would tend to decrease the likelihood of "daddy" being said again. He might learn to fear the word "daddy" and perhaps, if the stimulation were aversive enough and frightened him often enough, he might avoid making sounds at all. Avoidance would be self-reinforcing because by refraining from speech he would be preventing (i.e., he would not experience) the fear-arousing

stimulation. All the customary means of encouraging speech in this child would fail; because of his particular hypersensitivity these efforts might serve to reinforce the avoidance behavior.

The above illustration is an example of only one way in which early learning can go awry. Certainly there are many other ways to impair learning even in the simple case of the acquisition of a discrete response, "daddy," to a discriminative stimulus. The child could be intellectually deficient, visually impaired, undernourished, in pain, or tired -- all of these states would hamper the infant's ability to attend to the stimulus, appreciate the reinforcement, or make the connection between them. The perception of reinforcement or the sensitivity to reinforcement can be a pivotal factor in learning by influencing the direction of future behavior. Another example, this time of non-social reinforcement, will help illustrate this point.

A young child who discovers a ball point pen is delighted with the way the point becomes visible and then retracts when he presses the top of the pen. The appearance and disappearance of the pen point are positively reinforcing to the child who plays with the pen for a while. Another child, equally attracted by the color of the pen, is startled by the "click" of the spring mechanism as the pen point moves. If the "click" is startling enough the child will drop the pen and the game will end. His future exploratory behavior will be likely to diminish.

The difference between the two children is their sensitivity to stimulation. Because of that difference their future behaviors will probably be very different from one another. The child with excessive fears, for whom the negative properties of the situation were more

impressive than the available positive reinforcements, could easily develop excessive, generalized, and inappropriate avoidance behavior. He could also conceivably develop in an acceptable manner. By being a good, quiet, obedient child -- if perhaps a timid one -- he can successfully avoid much of the aversive stimulation in his environment. The distinction between normal and pathological avoidance behavior, however, is not well-defined: The avoidance of social interaction to a benign degree is shyness. When interpersonal relations are severely restricted, we speak of eccentric isolation. At the extreme we recognize social withdrawal, and have entered the realm of psychopathology. Thus, a tendency toward avoidance would be self-perpetuating and self-reinforcing to the point of pathological withdrawal.

Withdrawal and loss of contact with reality play a central role in the definition of schizophrenia. Withdrawal can take many forms in schizophrenia, but the element of retreat from the immediate environment is generally apparent. The schizophrenic appears to be fleeing the stimuli around him, remaining with his hallucinations and delusions.

Is schizophrenic withdrawal an extension and generalization of avoidance behavior? Implicit in this question is the assumption of a particular sensitivity to aversive or punishing stimuli in the schizophrenic. The notion of a differential effect of punishment on schizophrenics as compared with normals has been investigated in a variety of ways.

A Brief Review of the Pertinent Literature

The body of literature studying differential reinforcer effectiveness

on schizophrenic and normal subjects can be loosely grouped under two themes, censure deficit and censure enhancement. Both trends assume greater sensitivity to punishment in the schizophrenic than in the normal subject, but they differ as to the hypothesized effect of the sensitivity on performance. Censure deficit theory predicts impaired performance in the schizophrenic in the presence of punishment, while censure-enhancement postulates improved performance under punishment.

Rodnick and Garnezy's (1957) censure-deficit model hypothesized that early childhood experiences of the schizophrenic were replete with censure and highly threatening; and as a result the schizophrenic learned withdrawal responses to reduce the anxiety which censure arouses. These withdrawal responses are undifferentiated and cause avoidance of the entire situation in which censure is experienced or threatened.

In the prototypic censure-deficit experiment, Garnezy (1952) matched 40 acute schizophrenics with normal subjects for age and education and had them pull a lever in response to a training tone. The subjects were then presented with four other tones along the pitch dimension under two conditions: 1) Reward only -- in which a box lit up the word "Right" when the lever was pulled at the training tone; and 2) Reward-Punishment -- in addition to the "Right" box, a box lit up the word "Wrong" at a response to the tone most dissimilar in pitch to the training tone.

Garnezy found that the discrimination of the normal subjects was better in the Reward-Punishment condition than in the Reward only condition. The schizophrenic subjects, however, while not improving their discrimination under Reward-Punishment, gave significantly fewer

responses to the generalized stimuli than they did under Reward only. It appeared that in their avoidance of the punished stimulus the schizophrenic subjects generalized and also avoided the training tone. This difference in the generalization gradient between the schizophrenic and the normal subjects did not occur under the Reward only condition.

In the Garmezy experiment it is unclear whether the schizophrenics' learning of the discrimination, or their performances, or both were adversely affected by punishment. Nevertheless, a censure-deficit was evident. Webb (1955) reported a similar censure-deficit in schizophrenic subjects on a conceptual task. The test was administered and the subject was told "You did much worse than would have been expected of you." Then the test was administered again. The performance of control subjects improved on the second testing, but that of the schizophrenics deteriorated. It appeared that the schizophrenic subjects manifested a censure-deficit, or an impairment in performance due to punishment.

Bleke (1955) refined the censure-deficit model, hypothesizing that the process involved in the performance deficit of schizophrenics was due to an internal interference which produced an inhibitory effect. He proposed that the inhibitory effect of this interference would dissipate more quickly than task-relevant tendencies during rest, and the result would be improvement after rest, or reminiscence. Bleke did find greater reminiscence in his schizophrenic subjects than in his nonschizophrenic subjects. He interpreted his results as indicating that greater anxiety among the schizophrenics had interfered with task performance. The interference dissipated during rest and lead to reminiscence.

While the interference hypothesis was well-supported by the Bleke experiment, its father, the censure-deficit model, did not fare as well. Cicchetti, Klein, Fontana and Spohn (1967) tested the censure-deficit model with the same discrimination task used by Rodnick and Garnezy (1957). Their results did not support the various assumptions of the model, nor did they find the predicted difference between schizophrenic and normal censure deficit. The experimental design in this case, as in the Webb experiment, did not employ an avoidance paradigm. The subject was told, "So far, X, you've been doing quite poorly" -- there was no way in which censure could be avoided.

An avoidance paradigm was employed by Buss, et al. (Buss, Braden, Orgel and Buss, 1956; Buss and Buss, 1956) in investigations of the effect of verbal reinforcement on both verbal learning and conceptual learning. They used three different verbal reinforcement combinations with "neuropsychiatric" patients as subjects: 1) The experimenter says "Right" after a correct response and says nothing after an incorrect response (Right-nothing); 2) The experimenter says nothing after a correct response but says "Wrong" after an incorrect response (nothing-Wrong); 3) The experimenter says "Right" after a correct response and "Wrong" after an incorrect response (Right-Wrong).

Learning in both experiments proceeded at similar rates in the Right-Wrong and the nothing-Wrong conditions, and was slowest in the Right-nothing condition. When the subject was learning under threat of social censure ("Wrong") he learned fastest.

This demonstrated effectiveness of social censure upon schizophrenics is in sharp contrast to the almost totally ineffective results obtained with social approval as a reinforcer for learning in

schizophrenia (Cohen and Cohen, 1960; Cavanaugh, Cohen and Lang, 1960; Leventhal, 1959; McCarthy, 1963).

The experimental findings appear to be inconsistent. An attempt to clarify the ambiguities was made by Atkinson and Robinson (1961). They tested schizophrenic and normal subjects on a paired associate learning task using both social and nonsocial reward and punishment. The social reinforcement was the experimenter saying "right" in the reward condition and "wrong" in the punishment condition. The nonsocial reinforcement was the sound of an old adding machine which followed the correct response in the reward condition and followed an incorrect response in the punishment condition.

The results were clear and unambiguous. While the normal subjects performed best (with fewest trials to criterion) in the reward conditions, the schizophrenic subjects learned faster with punishment than with reward. The social or nonsocial nature of the reinforcement had no effect, i.e., the noise and the experimenter's responses were equally effective.

Atkinson and Robinson explained their results and their apparent contradiction with some of the earlier studies in terms of task parameters. They suggested that when the task is such that the only way to avoid censure (or other aversive stimuli) is to respond correctly, the schizophrenic will learn the correct response. But when the task situation allows for some other means of avoiding punishment (for example, not responding at all), learning will be impaired. This appears to be a plausible explanation for the performance of the schizophrenic subjects; however, the control subjects in the Atkinson and Robinson experiment behaved in an atypical fashion by learning faster with reward than with punishment.

Learning in both human (Buss, et al., 1956; Brackbill and O'Hara, 1958; Penney and Lupton, 1961; Meyer and Offenbach, 1962) and infrahuman subjects (Hodge and Stocking, 1912) generally occurs faster under punishment than under reward conditions. The fact that the performance of the controls in this study is in contradiction with the findings of many previous investigations questions the generality of the Atkinson and Robinson results.

Nevertheless, further evidence for the schizophrenic's ability to improve his performance in order to avoid a threatening, or potentially threatening situation comes from a recent study by Gelburd and Anker (1970). They gave schizophrenic subjects the task of crossing out all the "A's" on a typed sheet of paper, and measured the effect the presence or absence of the experimenter had on the speed of letter cancellation. In the Task-Rest condition, the experimenter was always present in the room with the subject. In the Task condition he was present during the task but absent from the room during the resting intervals. In the Rest condition, the experimenter was present during rest only. The results showed that letter-cancelling speed increased in the Task condition and declined in the Rest condition. Gelburd and Anker concluded that the experimenter's presence was aversive for the subjects, and they worked quickly in order to reach the rest interval and be free of him. One could reason that the Task condition elicited high rates of behavior from the subjects because the presence of the experimenter was motivating. However, if this were true, the speed in the Task-Rest condition would have equalled that of the Task condition, for the experimenter was present in both cases while the subject worked. The two conditions did not elicit similar rates of letter-cancellation and

subject worked fastest when he was reinforced by the experimenter leaving the room. Escape from a noxious stimulus (the experimenter) facilitated the performance of schizophrenic subjects.

While there are ambiguities among the findings, the weight of the evidence seems to indicate better performance in schizophrenics under negative reinforcement than under positive reinforcement (Silverman, 1963). This appears to be true both for verbal or social reinforcement and for physical reinforcement. More than 20 years ago, Pascal and Swensen (1952) found that when the correct response to a complex discrimination reaction-time task removed the sound of high intensity white noise, the usual handicap of the schizophrenic patients disappeared. That is, when escape from an aversive stimulus (noise) was contingent upon quick correct responding, the performance of schizophrenics was no different from that of normals. Reduction or elimination of the schizophrenic's learning deficit has been consistently shown whenever escape or avoidance of physical punishment is contingent upon learning (Cavanaugh, 1958; Buss and Lang, 1965; Rosenbaum, Macavey and Grisell, 1957; Lang, 1959).

In a variety of learning tasks and with different types of reinforcement, the schizophrenic has shown superior performance under punishment than under reward. These findings lend credence to the hypothetical construct of heightened sensitivity to aversive stimuli in schizophrenia, and to the hypothesis of hypersensitivity leading to effective (and, indeed, excessive) avoidance learning.

The Role of Other Variables

It is tempting at this point to simplify and say, "In the light of the evidence, schizophrenics show superior performance under

punishment than under reward. Case closed." However, it is evident from those studies that failed to find improved performance under negative reinforcement in schizophrenia that the issue is not clear-cut and has not yet been satisfactorily resolved. Contradictory findings cannot be ignored nor glibly explained away. Possible causes or contributing factors must be sought and their effect upon or interaction with reinforcement examined.

A number of task variables have been implicated as undermining the effectiveness of reinforcement. One of these variables is the complexity of the experimental task. Streiner (1969) measured speed of learning in low and high complexity paired-associate tasks under both negative and positive reinforcement conditions. On the low-complexity task speed of learning was independent of reinforcement. But in the high complexity task condition learning took place more quickly with punishment (censure) than with reward.

The Streiner experiment is a good illustration of the effect of one other variable (task complexity) on reinforcer effectiveness. Clearly, the effectiveness of reinforcement can neither be examined nor understood in a vacuum; subject variables as well as task variables must be taken into account. Subject variables can be especially pervasive in a schizophrenic population where large individual differences and difficulties in replicating experiments are the rule. Paranoid and nonparanoid schizophrenics differ on a variety of measures, as do process and reactive schizophrenics. The process schizophrenic is the long-term patient whose illness had an insidious onset and, unfortunately, has a poor prognosis. The reactive schizophrenic, on the other hand, has had a good premorbid adjustment preceding the acute onset of his illness. The reactive patient tends to be short-term and to have a

good prognosis (Herron, 1962; Higgins, 1964; Higgins and Peterson, 1966). Process-reactive differences are genuine and meaningful. When True (1966) distinguished his schizophrenic subjects according to the process-reactive dichotomy, he found no differences between the learning of abstract responses in reactive schizophrenics and normals, but his process schizophrenic subjects failed to learn at all.

Within the bounds of the category "schizophrenia," then, we are aware of many subgroups and systematically varying elements that can and do affect performance. Some of the concomitants of serious illness and hospitalization intrude into and influence the study of reinforcer effectiveness in schizophrenia. Premorbid adjustment (Magaro, 1969), chronicity, and age of the subject (Drennen, Gallman, and Sausser, 1969) have been found to interact with reinforcement and affect performance.

We find, then, that particularly with the schizophrenic population, a statement regarding the relative effectiveness of positive or negative reinforcement must be qualified by many other factors. The existence of these qualifying (and confounding) variables serve to confuse the issue of the effect of reinforcement on learning in schizophrenia. As the variables are identified and examined, the main effect -- type of reinforcement -- seems to recede into the background. The figure of reinforcement becomes difficult to see against the ground of extraneous variables.

One way to try and overcome the problem of background "noise" of confounding variables within studies of schizophrenia is to approach the problem, as we have, from a prospective developmental point of view. Thus, instead of asking, "Is the schizophrenic particularly adept at avoidance learning?" we can ask, "Does sensitivity to aversive

stimulation precede the onset of schizophrenia? Can such sensitivity be detected before pathological behavior is manifested?" (If it can be detected before the onset of schizophrenia, then we can talk about hypersensitivity to punishment as a precursor of, precondition for, or even as a contributing factor to the development of schizophrenia.)

One approach to the prospective developmental study of schizophrenia is the high risk method. High risk research involves the longitudinal study of a population which has a greater likelihood than the general population of developing schizophrenia. In this case it is the children of a schizophrenic parent who are at significantly greater risk for schizophrenia than the population at large.

The High Risk Method

Mednick and McNeil (1968) discuss the methodological advantages in the prospective study of high-risk samples as follows:

1. "The subjects are not yet schizophrenic; they have not experienced the epiphenomena of the illness, thus their reactions on the tests are not contaminated by these epiphenomena" (Mednick and McNeil, 1968, p. 687). The epiphenomena of schizophrenia would include, for example, drug effects and institutionalization. These variables, when studied for their own sakes, have been found to have important effects on perception (Silverman, Berg and Kantor, 1966), personality tests (Braginsky, Grosse and Ring, 1966), interview data (Pokorny, 1962), psychological adjustment (Knutfer, Clark and Room, 1966), and family harmony (Crain, Sussman and Weil, 1966a, 1966b).

Most research in schizophrenia is done on subjects who are already schizophrenic, thus confounding the variables of schizophrenia with the correlates of the illness. Silverman (1964), for example,

found that normals, acute schizophrenics, and chronic schizophrenics (in that order) showed increasingly severely restricted perceptual scanning and narrow concept width. Because of the great differences among the groups in length of hospitalization, Silverman et al. (1966) repeated the experiment with long-term and short-term non-psychiatric prisoners, matched to the schizophrenic subjects for length of institutionalization. They found that the differences observed in the perceptual and conceptual performance of the "acute" and "chronic" prison inmates were nearly identical to those found between the acute and chronic schizophrenics. Thus, the differences which would have been ascribed to schizophrenia were really due to the effects of institutionalization, and were unrelated to psychopathology.

The correlates of schizophrenia such as bachelorhood, loneliness, pre- and post-hospital drug treatments, social failure, and institutionalization make it almost impossible to find adequate controls for an already-schizophrenic subject. The high risk method of research avoids this problem.

2. "The researchers, relatives, and the subject himself do not know that he will become schizophrenic. This relieves the data of a certain part of the burden of bias. The bias, in any case, is not greater for the future schizophrenic than for the other high-risk subjects who do not succumb to schizophrenia" (Mednick and McNeil, 1968, pp. 687-688).

3. "The information gathered is current, not retrospective. That part of the investigation which is retrospective is less so than it would be if the subjects were adults" (Mednick and McNeil, 1968, p. 688).

Fontana (1966) evaluated the research dealing with the "familial etiology of schizophrenia" and concludes that the unreliability of

parental memory invalidates such historical data for scientific use. This conclusion is supported by the results of Mednick and Schaffer (1963). Fontana examines the methodological failings in retrospective family studies, and raises the problem of the "etiological assumption" upon which family studies in schizophrenia are based. The cause-effect relationship is not at all clear. It is just as reasonable to assert that the presence of a schizophrenic child had a role in the development of family disturbance as it is to assert the opposite. In fact, family conflict and maternal overprotection have been found in families with a chronically ill child where it is more likely that the overprotection and discord is a result, rather than a cause, of the child's illness; as parents of diabetics (Crain, et al., 1966a, 1966b), hemophiliacs (Matsson and Gross, 1966), infantile paralytics (Rosenbaum, 1943), and children with scoliosis and osteomyelitis (Kammerer, 1940).

4. "The data are uniformly and systematically collected. This is in contrast to retrospective studies which make use of childhood records and school records of adult schizophrenics" (Mednick and McNeil, 1968, p. 688).

In addition to the problem of sampling bias, research based on data from the childhood records of schizophrenics has to cope with the different vocabularies and styles of different therapists and teachers. "If one therapist calls a patient 'nervous,' is this the equivalent of what another terms 'tense'? . . . And if a child was not explicitly called 'nervous,' does this mean he was not nervous, or that the therapist saw no gain in mentioning this factor in his case report?" (Mednick and McNeil, 1968, p. 686). These questions are difficult to

answer when one is working with case records that are 20 - 30 years old.

5. One advantage specific to the high-risk group method is that "the ideal controls for the high-risk subjects who become schizophrenic are the high-risk subjects who develop other deviances, and the high-risk subjects who do not become deviant. Such controls are an integral part of the design" (Mednick and McNeil, 1968, p. 688).

Limitations of the High Risk Design. There are many problems inherent in a longitudinal study covering a long span of time. Technical problems are so complex that longitudinal research designs are often avoided. A major obstacle is the problem of subject loss: people move, get married, change their names, and cannot be located for follow-up investigations. This problem is minimized in Denmark, where the present investigation took place. Emigration from Denmark is rare, and as long as our subjects remain in Denmark they can be located by means of the "Folkeregister," the central register of all names and addresses in the country. Another national register, the psychiatric register, keeps records on all admissions to psychiatric wards or hospitals in Denmark. Their cooperation makes it possible for us to discover which of our subjects' names have appeared in the psychiatric register, and we can then check the appropriate records to find out when the admission took place, for what reason, the length of hospitalization, etc.

Even when this type of problem can be overcome, a longitudinal study has one tremendous drawback. It is expensive. With time as an independent variable, costs are high and results proportionally low. The investigator is literally waiting to see what will happen. Waiting is not only frustrating and costly, it is dangerous. Since the

science of psychology advances over time, longitudinal investigations run the risk of having their methods and measures become outdated -- after 20 years one can be left with antiquated, useless information. This problem can be overcome somewhat by careful change, improvement, and modernization of methods with each successive followup. But change or substitution of experimental measures can be done only with great caution, and always with the question in mind, "Is this new measure comparable to the old one?" The information we hope to gain from longitudinal research would tell us how today's behavior compares with earlier behavior. Thus, our ways of measuring behavior must be highly similar on both occasions in order to be meaningful.

The cumbersomeness of the high risk method is felt most keenly in the interim stages when the data are crude and therefore difficult to interpret. Since most of the High Risk group will never become schizophrenic, the characteristics of the preschizophrenic subgroup may "wash out" and not become apparent until those who break down can be identified and their earlier performance on the experimental measures examined.

Finally, and perhaps most importantly, there is the problem of generalizability of results. The High Risk subjects who will eventually become schizophrenic will be part of a very particular subgroup of the general population of schizophrenics, namely, schizophrenics-who-have-a-schizophrenic-parent. Since most schizophrenics have not had a schizophrenic parent, our subjects will be atypical.

The Present Study

The present study asks the question, "Is sensitivity to punishment a precursor of schizophrenia?" and attempted to answer it by measuring

the speed of learning a visual discrimination task under conditions of positive and negative verbal reinforcement in children at high risk for schizophrenia.

The performance of the High Risk or Experimental children on the discrimination task was compared with the performance of matched low risk (Control) subjects as well as matched subjects who are at high risk for other types of psychopathology (Reactives). The Reactive group was included in order to control for the general effects of familial psychopathology, thus facilitating the distinction between those effects unique to schizophrenia from those shared by other behavioral disturbances.

A similar study of children at high risk for schizophrenia was begun by Mednick and Schulsinger in 1961. They reported (Mednick and Schulsinger, 1968a, 1968b) differences between the High Risk and Low Risk groups, as well as characteristics of those children who later broke down. The addition of the Reactive control group to the design may help clarify the nature of those earlier High Risk-Low Risk differences.

We began, then, with the following question: Are children at high risk for schizophrenia more sensitive to punishment than a) Low Risk children, and b) children at high risk for other psychopathologies?

A corollary to the main questions of the study was "What is the relationship of the Experimenter's subjective impressions of the children with their performance under punishment or reward?" When reward and punishment are social in nature, the interpersonal context in which they take place bears scrutiny. The Experimenter completed an Adjective Checklist after testing each child. The performance of the children on the experimental task is viewed in the light of the Experimenter's perceptions.

The present investigation entailed the construction of a discrimination test designed specifically for this study, the Avoidance Test. The fixed order in which the test was administered necessitated the evaluation of the effect of practice on the experimental task. We therefore have a small study within a study. A group of schoolchildren were used to test the hypothesis that practice has a definite and unsystematic effect in the Avoidance Test.

Chapter II

METHOD SECTION

Description of the Sample: Criteria for Inclusion in the Groups and Matching Considerations

The samples used in the present investigation were taken from a population of 9,000 births which took place in Copenhagen's Rigshospital from autumn 1959 through the winter of 1961. The Danish national Psychiatric Register (central register of all admissions to psychiatric hospitals or psychiatric wards in general hospitals for the entire country) was searched for the names of the parents of these children, and the hospital records of those noted in the Register were located. The hospital journals were examined by two independent, "blind" psychiatrists who made their separate diagnoses. Differences were discussed, and all diagnoses were ultimately agreed upon.

The Experimental Group

The children in this group have either a mother or a father who was hospitalized for a complaint which was judged to be within the schizophrenic spectrum, as follows (Kety, et al., 1968, p. 352):

1. Chronic schizophrenia ("chronic undifferentiated schizophrenia," "true schizophrenia," "process schizophrenia").

Characteristics: (1) Poor pre-psychotic adjustment;
introverted; schizoid; shut-in; few peer contacts; few

peer contacts; few heterosexual contacts; usually unmarried; poor occupational adjustment. (2) Onset -- gradual and without clear-cut psychological precipitant. (3) Presenting picture: presence of primary Bleulerian characteristics; presence of clear rather than confused sensorium. (4) Post-hospital course -- failure to reach previous level of adjustment. (5) Tendency to chronicity.

2. Acute schizophrenic reaction ("acute undifferentiated schizophrenic reaction," "schizo-affective psychosis," "possible schizophreniform psychosis," "acute paranoid reaction," "homosexual panic.")

Characteristics: (1) Relatively good premorbid adjustment. (2) Relatively rapid onset of illness with clear-cut psychological precipitant. (3) Presenting picture: presence of secondary symptoms and comparatively lesser evidence of primary ones; presence of affect (manic-depressive symptoms, feelings of guilt); cloudy rather than clear sensorium. (4) Post-hospital course good. (5) Tendency to relatively brief episode(s) responding to drugs, EST, etc.

3. Borderline state ("pseudoneurotic schizophrenia," "borderline, ambulatory schizophrenia," "questionable simple schizophrenia," "psychotic character," "severe schizoid individual.")

Characteristics: (1) Thinking: strange or atypical mentation; thought shows tendency to ignore reality, logic and experience (to an excessive degree) resulting in poor adaptation to life experience (despite the presence of a normal I.Q.); fuzzy, murky, vague speech.

(2) Experience: brief episodes of cognitive distortion (the patient can, and does snap back but during the episode the idea has more the character of a delusion than an ego-alien obsessive thought); feelings of depersonalization, of strangeness or unfamiliarity with or toward the familiar; micropsychosis. (3) Affective: anhedonia -- never experiences intense pleasure -- never happy; no deep or intense involvement with anyone or anybody. (4) Interpersonal behavior: may appear poised, but lacking in depth ("as if" personality); sexual adjustment: chaotic fluctuation, mixture of hetero- and homosexuality. (5) Psychopathology: multiple neurotic manifestations which shift frequently (obsessive concerns, phobias, conversion, psychosomatic symptoms, etc.); severe widespread anxiety.

The experimental group comprises 72 children, 36 males and 36 females. They are matched, subject for subject, with 1) normal controls, 2) reactive controls.

Normal Controls

None of the parents of the Normal Controls have been hospitalized for a psychiatric complaint, nor have any of the mothers of these subjects been listed in the central criminal register ("Rigsregistraturen"). The Experimental subjects are matched to the Normal Controls on the following variables: sex, twin or singleton birth, mother's marital status at conception, number of previous pregnancies, mother's race,

mother's age, father's social status at child's birth, father's age, mother's weight, and mother's height.

When matching on all 10 variables was impossible, criteria were dropped one by one, in the reverse of the order listed (i.e., mother's height would be the first criterion disregarded, then mother's weight, etc.

Reactives

The parents of the subjects in this group meet one of the following criteria:

1. Main diagnosis of psychopathy
2. Main diagnosis of character deviation
3. Main diagnosis of character insufficiency

--- 1, 2, and 3 must not have had side diagnoses of schizoid, manic depressive, sensitive, paranoid, or organic conditions.

4. Main diagnosis of alcoholism
5. Main diagnosis of drug abuse
6. Main diagnosis of affect reaction
7. Suicide attempts
8. Short-term reactive depressions in connection with one of the above.
9. Repeated short-term depressions without any suspicion of manic-depressive psychosis.

--- 4, 5, 6, 7, 8, and 9 must not have been combined with side diagnoses of schizoid, manic-depressive, sensitive, paranoid, or organic conditions.

When the Experimental subject had a schizophrenic mother, his Reactive control also had a "reactive" mother. When the father of the Experimental subject was schizophrenic, he was matched with a

Reactive Control whose father, too, was sick. From that point on the matching criteria were the same as for the Normal Controls, and with the same priorities.

Insert Table 1 about here

On the Choice of Matching Variables

The groups are matched for mother's marital status at conception because we predict the existence of a relationship between marital status and the ease or difficulty of the pregnancy and delivery. Our prediction is based on the fact that there are two typical groups of women who are admitted to the maternity wards at the Rigshospital: 1) single women, and 2) married women who show signs of complications in their pregnancies and are referred to the Rigshospital by their obstetricians. The second group, naturally, will experience a greater number of birth complications.

Father's social class is the best measure of social status in Denmark (Svalastoga, 1959). The social class divisions are described in Appendix B.

There are no twins in the sample.

The children were given a day's battery of psychological, psychophysiological, and neurological testing, in addition to a social worker's interview of the family at home. A list of the experimental procedures used in the project is presented in Table 2.

Insert Table 2 about here

Table 1
Description of the Sample

Variable		Group		
		Experimental	Control	Reactive
Sex	male	36	36	36
	female	36	36	36
Mean Age		11.3	11.4	11.3
Mean Social Class		2.17	2.17	1.90
Mother's Marital Status at Conception	single	31	36	34
	married	28	28	28
	separated	5	2	6
	divorced	8	6	4
Mean Number of Previous Pregnancies		1.2	1.1	1.4
Mother's Mean Age at <u>S</u> 's Birth		26.5	25.9	25.9
Father's Mean Age at <u>S</u> 's Birth		30.5	29.8	30.1
Mothers' Weights	underweight	8	8	14
	average	43	52	39
	overweight	9	11	11
	no information	12	1	8
Mothers' Mean Height (centimeters)		163	163	162

Table 2

List of Experimental Procedures

Avoidance Test

Psychiatric Interview

Neurological Examination

Video Recording (Lunch)

Psychophysiological conditioning; EEG

Serial Position

Signal Detection

Dichotic Listening

Dominance (Eye-Hand)

Feffer Test

Word Association Test

Continuous Association Test

Memory for Designs

Adjective Checklist -- Completed by Experimenter

Adfærd Behavior List -- Completed by Experimenter

Social Worker Interview

I.Q. Test (WISC)

The Avoidance Test

Materials

Two sets each of 120 white, unlined cards were used. Two words were typed horizontally on the center of each card, as if on the same line. Around each word was a colored shape. One set of cards had red triangles and blue semi-circles; the other set had black circles and green squares.

Insert Figure 1 about here

The colored shapes each occurred 60 times on both the right and left sides of the cards, in random order. The cards were placed in a plastic book stand modified with a cardboard back which enabled E to present one card at a time to S while keeping the remaining cards and the score sheets behind the cardboard out of S's sight.

The stimulus words were no more than seven letters long. They were chosen from a frequency list of Danish children's books compiled from 215 books for children aged 7 to 9, and essays of children aged 9 to 14. The words used appeared in the list with a frequency of at least 25. Each of the two words on the card began with a different letter.

Procedure

S was seated at a desk behind the bookstand. E sat at the opposite side of the desk, facing S, and read the following instructions in Danish:

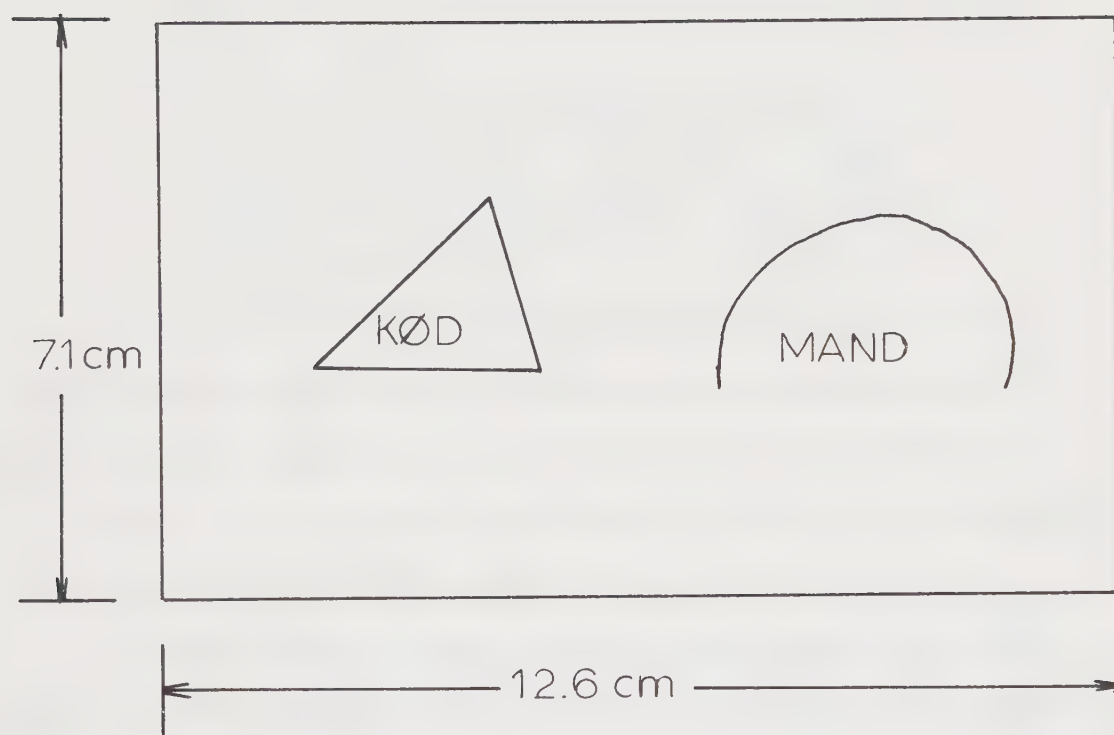


Fig. 1. Sample (actual size) of stimulus card in Avoidance Test.

Jeg vil nu vise dig nogle kort med to ord skrevet på dem. Læs et af ordene højt. Du skal ikke bruge tid til at tænke over det. Læs bare det ord du helst vil, så hurtigt du kan. Og tal højt og tydeligt. (After Baseline E says) Et af ordene vil være det rigtige hver gang, men jeg vil ikke fortælle dig hvilket. Det er det du skal finde ud af. Alt hvad jeg vil sige er "NEJ" når du siger det forkerte ord. Når du siger det rigtige ord siger jeg ingenting. Jeg har ikke lov til at svare dig på nogle spørgsmål under prøven, men jeg vil svare dig bagefter.

I will now show you some cards with two words written on them. Read one of the words aloud. Don't take time to think about it. Just read the word you prefer as quickly as you can. And speak loudly and clearly. (After Baseline trials E says) One of the words will be the right one each time, but I won't tell you which. That is what you must find out. All I will say is NO when you say the wrong word. When you choose the right one I will say nothing. I am not allowed to answer questions during the test, but I will answer them afterwards.

E interrupted the task only if S had great difficulty reading. In that case S was instructed to call out the first letter of the word he chose instead of reading the whole word.

Twenty baseline trials were presented first and E noted the color of the shape around the word S chose. This is what he recorded. Beginning with the first learning trial (the 21st trial), S was trained away from the color he had chosen more often. A choice of that color was immediately followed by the aversive stimulus, "NO," stated by E in a calm, matter-of-fact voice. Within the first 35 learning trials were five reversal trials in which the criterion for reinforcement was reversed. The position of the reversals was chosen randomly and was the same for all Ss. The purpose of the reversals was to encourage S to imagine all sorts of strategies, thus preventing the rate of learning from being purely

a measurement of intellectual learning.

The task was terminated when S had reached the criterion of ten consecutive correct trials or had been presented with 168 learning trials, whichever occurred first.

After completion of the aversive condition, E read the following instructions:

Nu skal ve prøve noget helt andet. Men forst vil jeg vise dig nogle kort med to ord skrevet på dem. Du skal bare vælge et af ordene. (After Baseline trials:) Nu vil jeg sige "JA" nar du læser det rigtige ord, og ingenting nar du læser det forkerte.

Now we will do something different. But first I will show you some cards with two words written on them. Just read one of the words aloud. (After Baseline trials) Now I will say "YES" when you read the correct word, and I will say nothing when you choose the wrong one.

E now repeated the procedure with the second set of cards, except that he said "yes" after the correct choice and said nothing following an incorrect choice. The criterion was ten correct consecutive trials, and the task was terminated after 167 learning trials if S did not reach criterion.

At the end of the entire procedure S was asked why he chose the words he chose ("Hvorfor valgte du de ord du valgte?" or, "Why did you choose the words you chose?") The purpose of the question was to determine whether S had understood the instructions and whether or not he could verbalize the criterion of the discrimination task.

Chapter III

RESULTS SECTION

The Experimental, Control, and Reactive groups show no differences in their color preferences during the baseline trials in either the positive or the negative reinforcement conditions. Of all the subjects tested, only one, a male Experimental, did not seem to have understood the instructions. He was among the subjects later dropped from the analyses for failing to learn in either reinforcement condition.

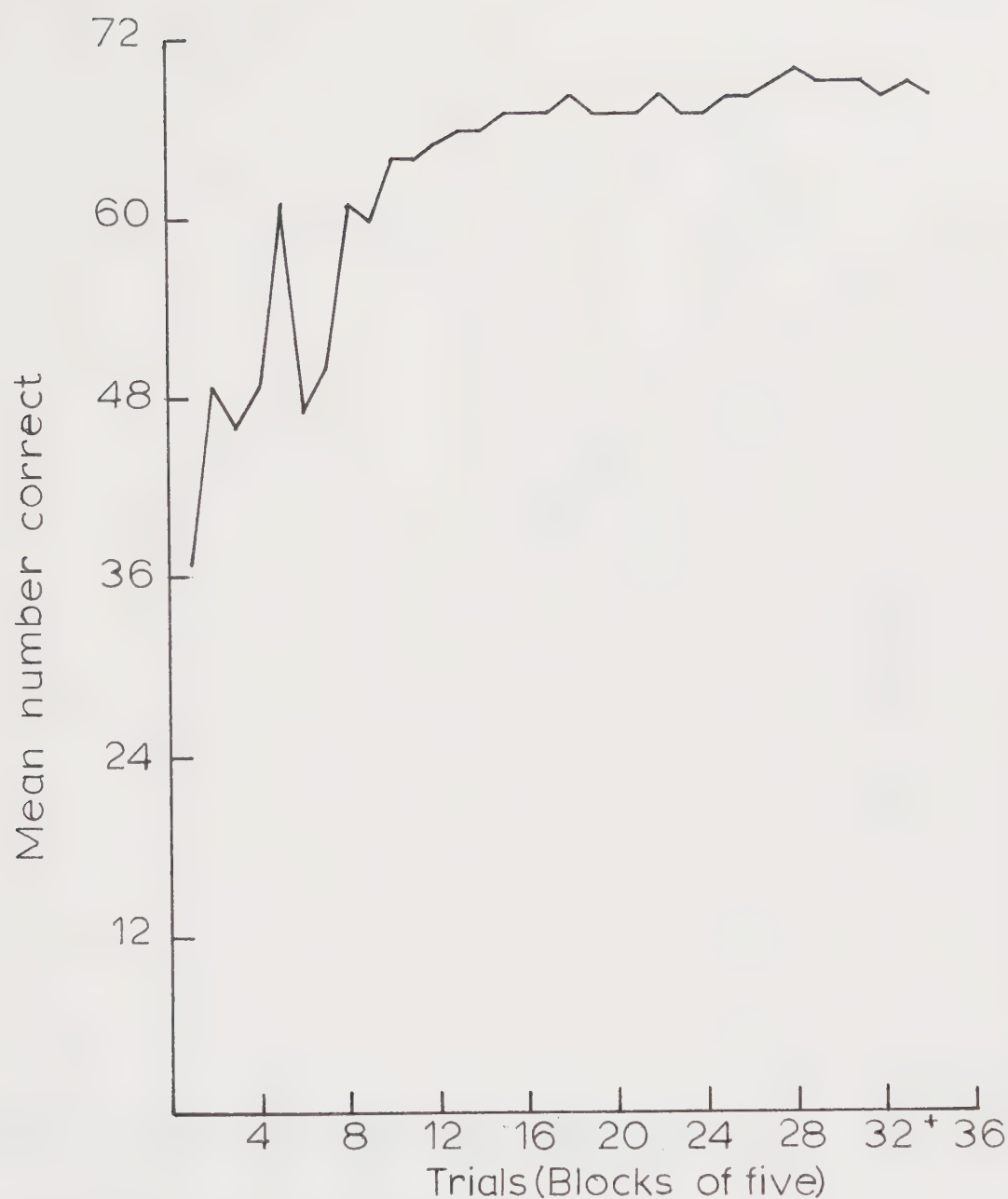
There are no group differences in the strategies the subjects reportedly used. There is, however, a tendency ($X = 3.61$, $df=1$, $p < .10$) for the males to report some strategy more often than the females.

Learning Curves

Figures 2 through 7 are learning curves for all three groups, in both the positive and the negative reinforcement conditions.

The acquisition of the correct response is measured by the mean number of correct responses for the group in each block of five trials. Subjects who reached the criterion for learning and ended the test were considered to have continued to give correct responses for the remainder of the 167 or 168 trials.

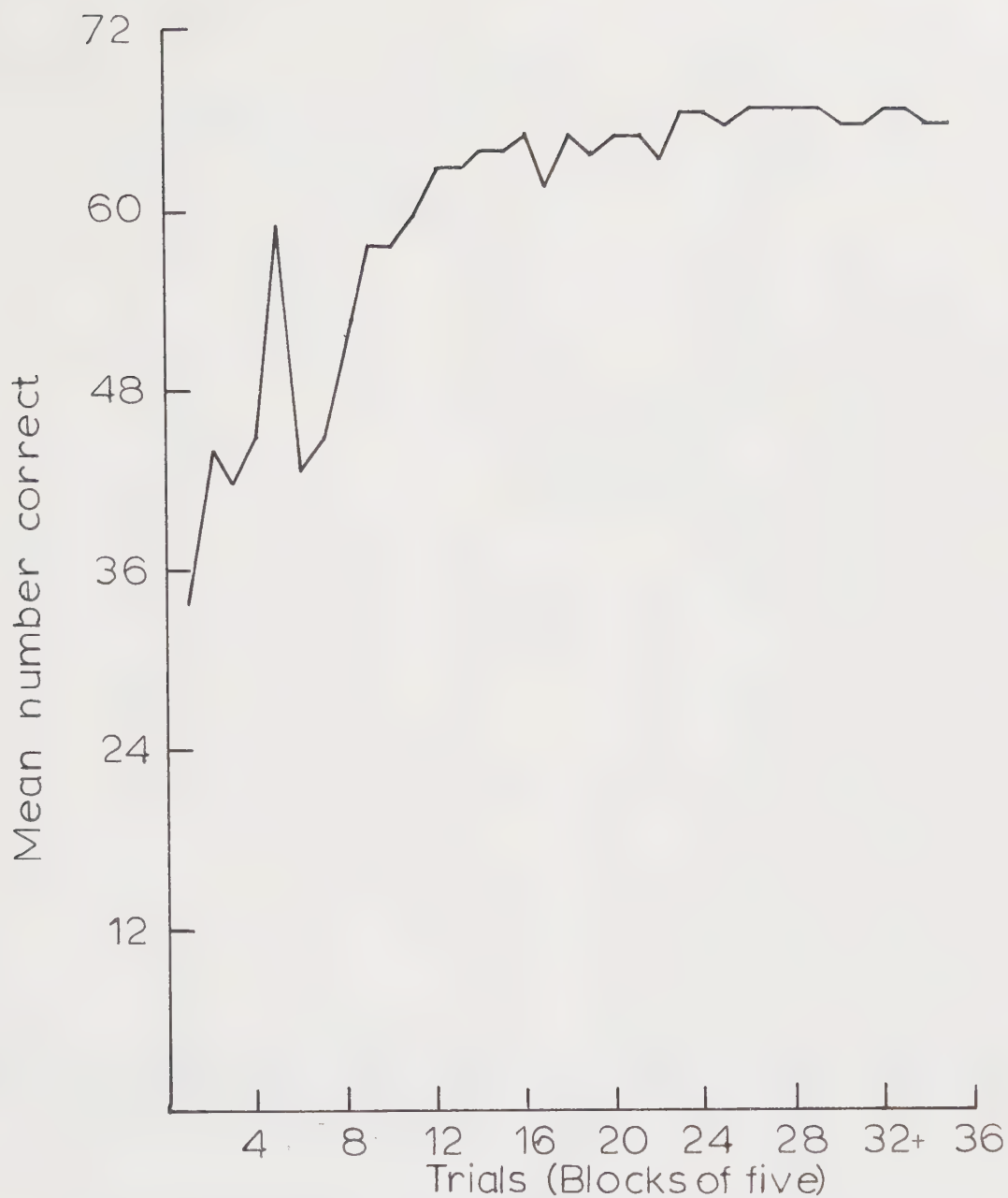
Insert Figures 2 through 7 here



+ Block 34 consists of two trials only.

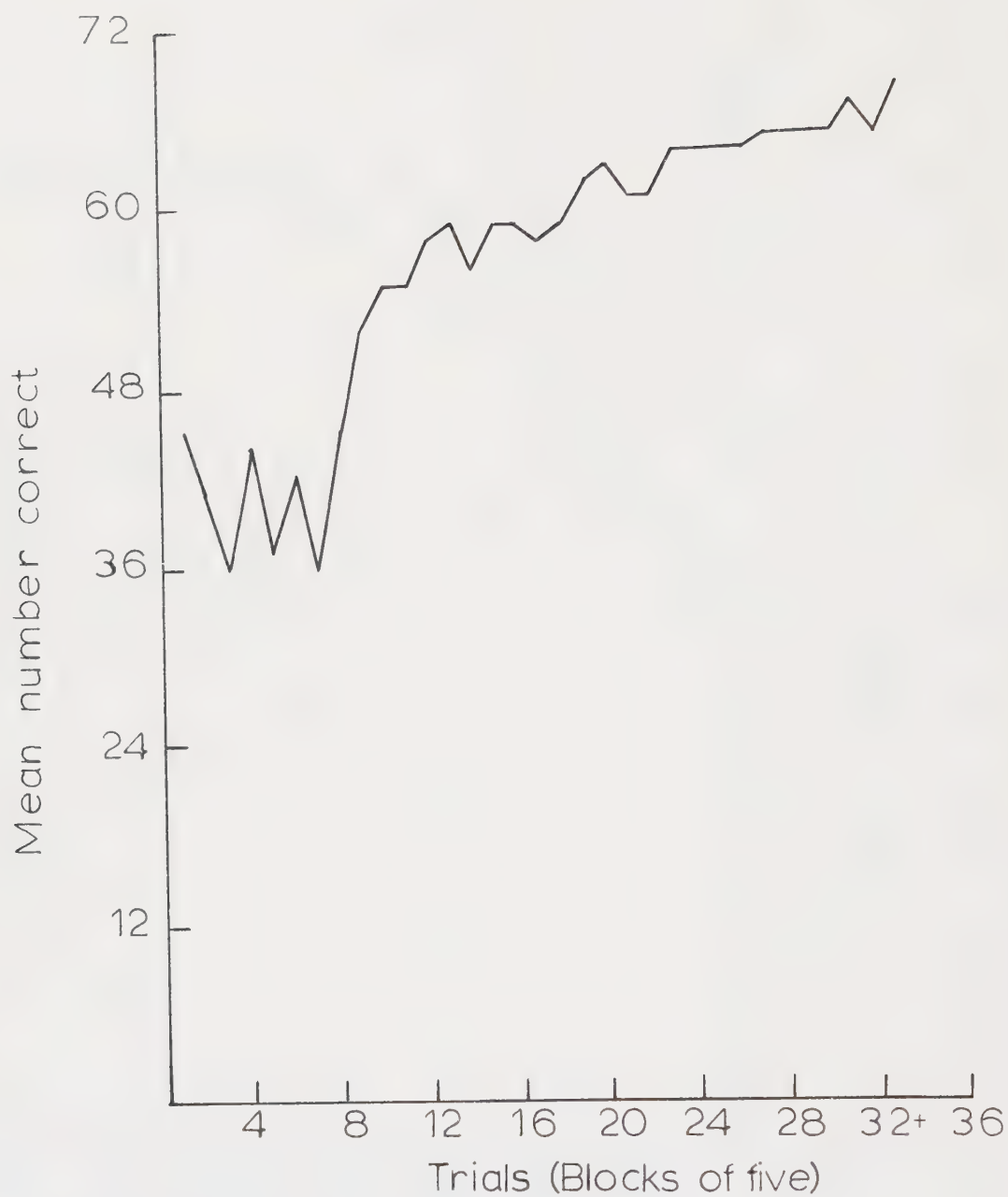
Fig. 2. Experimental positive.

Fig. 3. Experimental negative.



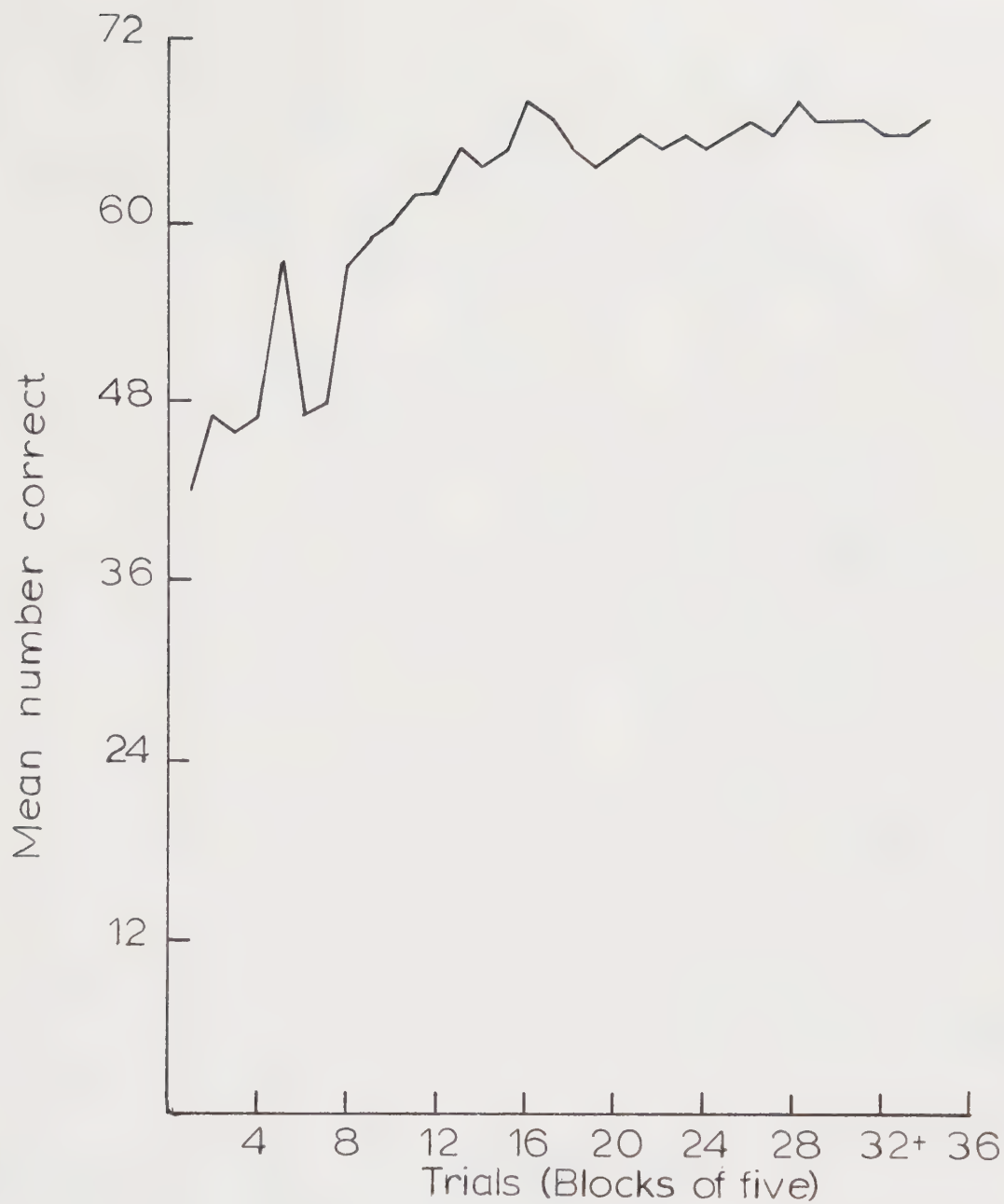
Block 34 consists of two trials only.

Fig. 4. Control positive.



Block 34 consists of two trials only.

Fig. 5. Control negative.



Block 34 consists of two trials only.

Fig. 6. Reactive positive.

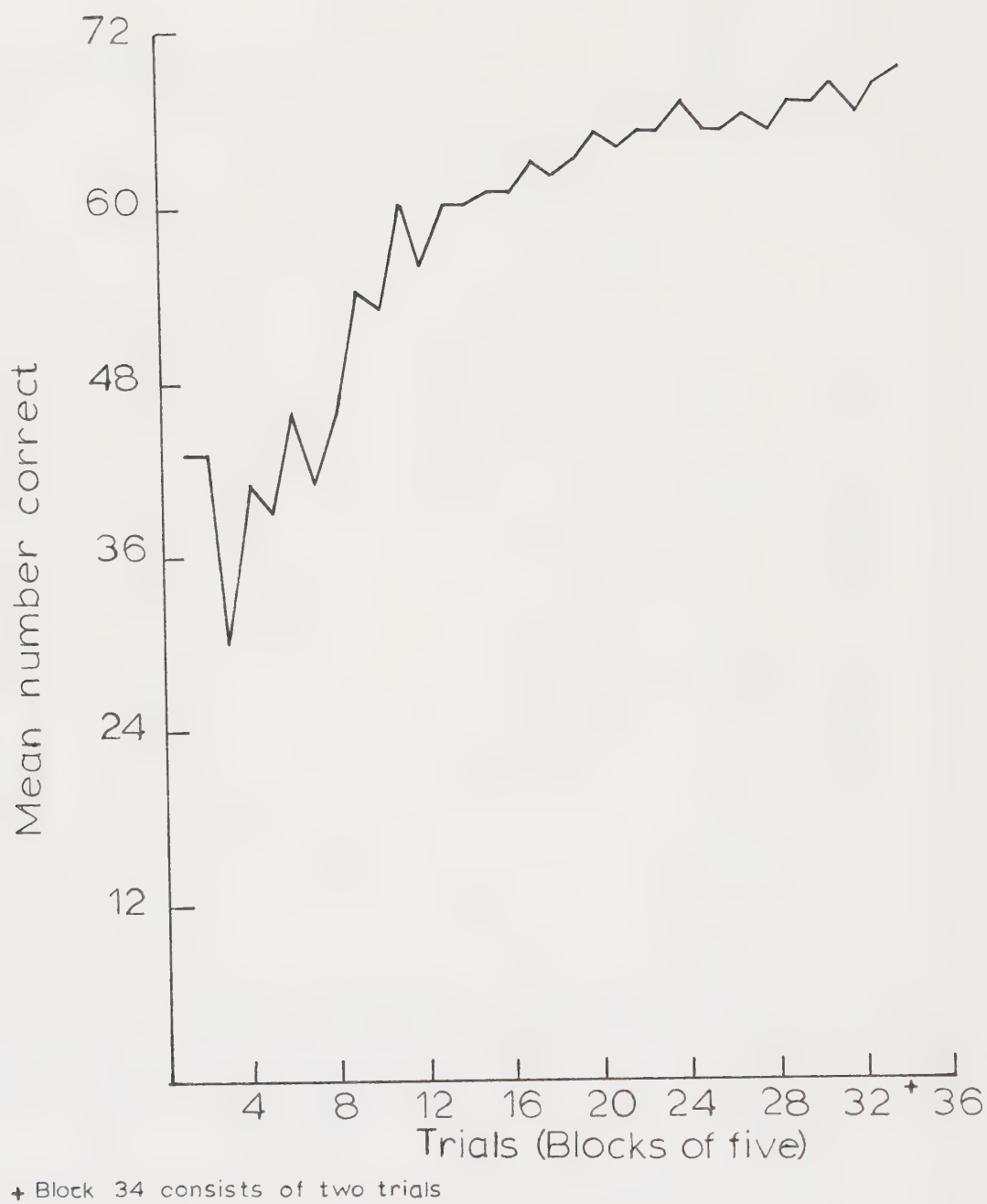


Fig. 7. Reactive negative.

The averaging effect of the aggregate learning curves is so strong it overrides both the individual and the group differences; the learning curves appear to be identical although we shall see that there are differences. Subgroup characteristics (see Figure 8) are not dominant enough to assert themselves in the shapes of the curves.

Number of Trials to Criterion (TTC-10)

Scores were derived by counting the number of trials each subject needed before reaching the criterion of 10 consecutive correct responses. If a subject completed the test without having 10 correct responses in a row, he was arbitrarily scored 170. Means of the TTC-10 scores for the entire sample are presented in Table 3.

Insert Table 3 about here

Analysis of variance reveals significant sex x reinforcement ($F=6.4203$; $df=1,209$; $p < .05$) and group x sex x reinforcement ($f=6.2012$; $df=2,209$; $p < .05$) interactions.

Insert Table 4 about here

Insert Table 5 about here

These effects are evident in the plotted means of Figure 8.

Insert Figure 8 about here

Table 3
Mean TTC-10 Scores
Entire Sample

Group	TTC-10	
	Negative Reinforcement	Positive Reinforcement
Experimental Males	72.78	56.75
Experimental Females	80.09	43.14
Reactive Males	58.86	65.00
Reactive Females	80.11	49.19
Control Males	81.42	60.67
Control Females	80.19	72.42

Table 4
Avoidance Test Scores
Main Effects

Item	df	MS	F	p
Group	2	5200.5781	1.5300	NS
Sex	1	278.7974	0.0824	NS
Reinforcement	1	33722.8672	35.8094	< .01

Table 5

Avoidance Test Scores

Analysis of Variance

Source of Variation	df	MS	F	p
Group x Reinforcement	2	2099.3105	2.2292	NS
Sex x Reinforcement	1	6046.2070	6.4203	< .05
Group x Sex x Reinforcement	2	5839.8828	6.2012	< .05
Group x Sex	2	667.6033	0.1964	NS

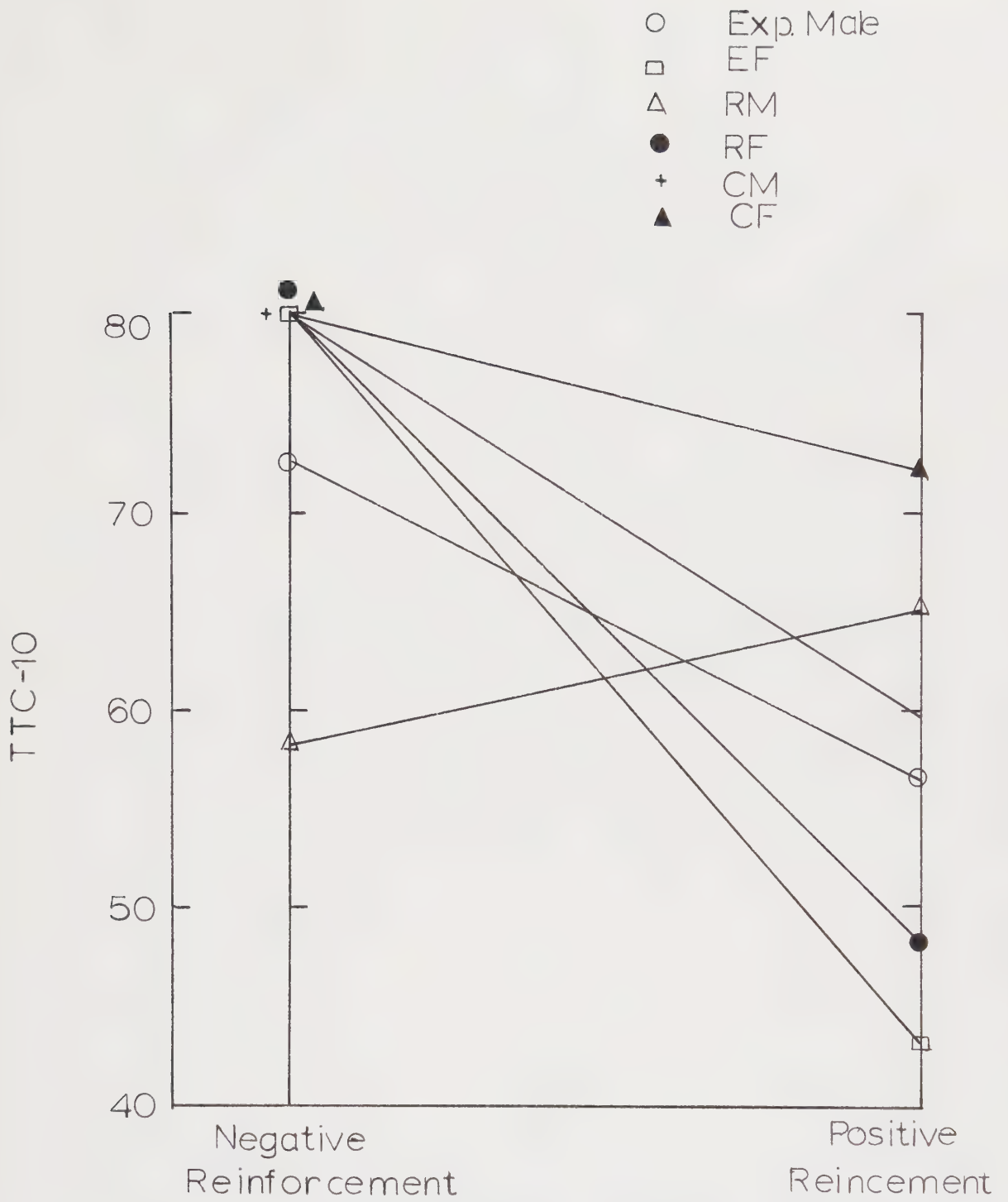


Fig. 8. Mean scores on Avoidance Test.

The Experimental, Control, and Reactive females, and the Control males perform about equally poorly under negative reinforcement. Experimental males are somewhat faster, and Reactive males are by far the fastest learners in the negative condition ($t=2.3114$; $p < .05$). The positive side of the figure presents a quite different picture. Experimental and Control females are now at opposite extremes, with Experimental females learning most quickly, and Control females more slowly than the others under positive reinforcement.

In order to obtain a more refined measure of central tendency which would reflect a more realistic picture of the group differences, the weakest learners were dropped and the group means recomputed. The subjects removed for this analysis either 1) failed to reach the criterion of ten consecutive correct responses (TTC-10) in both conditions, or 2) failed to reach TTC-10 in the negative condition and took 130 or more trials to criterion in the positive condition. The subjects removed for non- or very weak- learning are as follows:

- 5 Experimental males
- 1 Experimental female
- 3 Reactive males
- 1 Reactive female
- 5 Control males
- 5 Control females

The new means are presented in Table 6; graphically in Figure 9.

Insert Table 6 about here

Insert Figure 9 about here

Table 6

Table of "New" Avoidance Means

Group	TTC-10	
	Negative Reinforcement	Positive Reinforcement
Experimental Males	57.09	39.77
Experimental Females	77.44	39.41
Reactive Males	48.76	56.00
Reactive Females	77.54	45.74
Control Males	67.13	43.35
Control Females	65.77	56.77

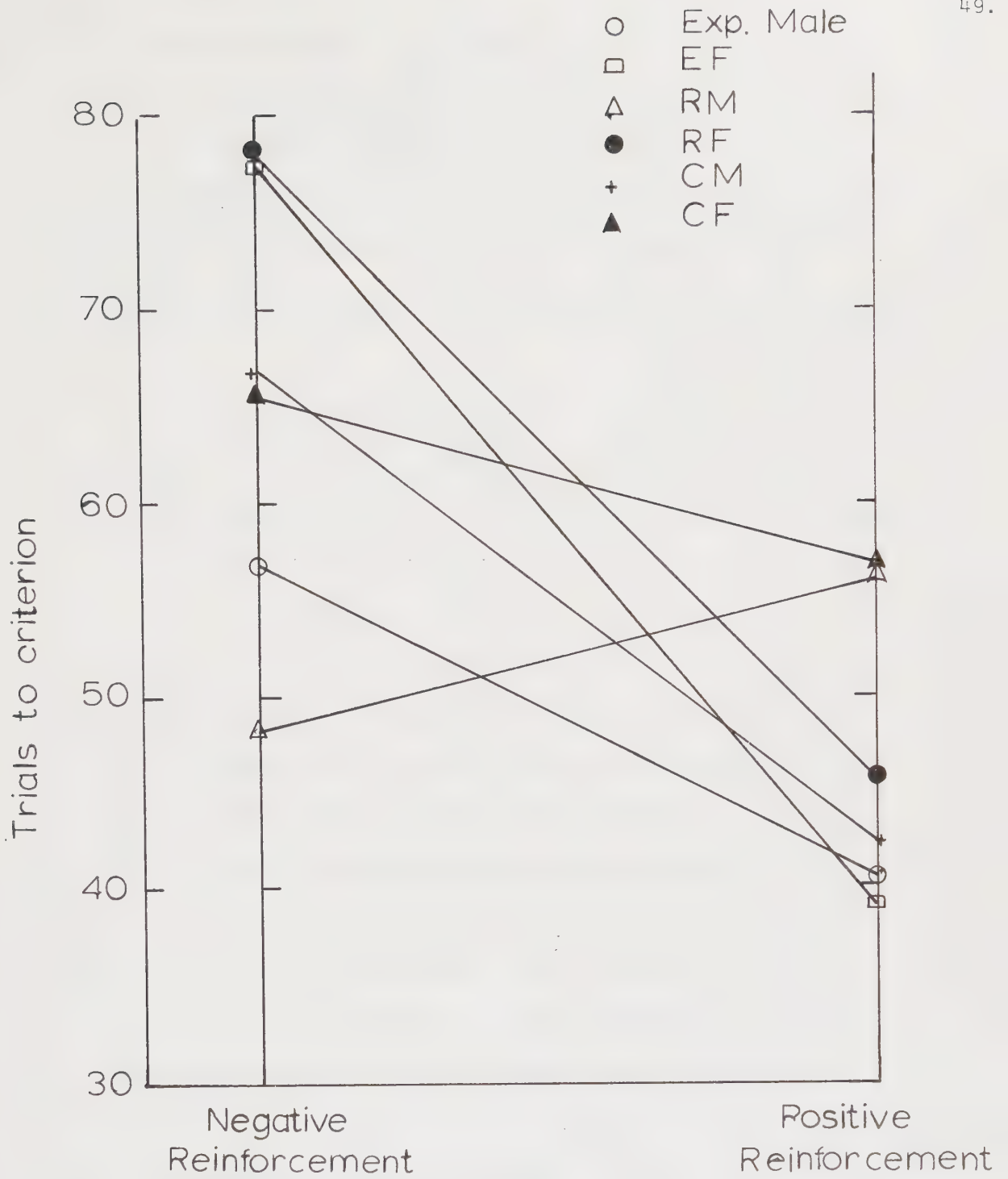


Fig. 9. "New" Avoidance means after removal of non-learners.

Removal of the non-learners and very weak learners has lowered the means of the Control male and female groups so that, in the negative condition, the two pathological female groups (Experimental and Reactive) remain alone together as the slowest learners.

Analysis of variance was performed on the scores that remained after removal of the non-learners, and the results are presented in Tables 7 and 8.

Insert Table 7 about here

Insert Table 8 about here

A main effect of sex is now present at the .05 level of significance.

It thus appears that the group x sex interaction detected by analysis of variance under negative reinforcement is largely due to the differences between the males and the females of the pathological groups. A t-test performed on the mean of the combined scores of RF and EF and the mean of the combined RM and EM scores yielded a highly significant t-value of 7.09566 ($p < .001$). The psychopathologic males perform significantly better than their female counterparts in the negative condition.

In the positive condition, removal of the non- and weak-learners shortens the distance between the groups but leaves the Experimental females and the Control females as the respective fast and slow extremes. The differences between the groups in the positive condition are not significant.

Table 7
Analysis of Variance after Removal
of Non-Learners

Main Effects	df	MS	F	p
Group	2	814.2708	0.5941	NS
Sex	1	6910.7254	5.0425	< .05
Reinforcement	1	34306.7451	33.5569	< .01

Table 8
Analysis of Variance of Avoidance Scores
after Removal of Non-Learners

Interactions	df	MS	F	p
Group x Sex	2	143.9636	0.1050	NS
Group x Reinforcement	2	2060.8887	2.0158	NS
Sex x Reinforcement	1	5465.0962	5.3456	< .05
Group x Sex x Reinforcement	2	6067.3915	5.9348	< .01

An interesting feature in figures 8 and 9 is the slope of the Reactive male group's line. While all the other groups slope downward from left to right, indicating the expected improvement in learning from the first (negative) condition to the second (positive) condition, the slope of the RM group is upward from left to right. The performance of the Reactive males deteriorated from the first, negative, condition, to the second.

Difference Scores. The significance of the differences in performance from the negative to the positive condition was tested by means of the McNemar Test for Significance of Changes (Siegel, 1956). The results are presented in Table 9.

 Insert Table 9 about here

Only three of the groups, Experimental and Reactive females, and Control males, show significant improvement. The decline of the Reactive males, while curious, is not statistically significant. Nevertheless, because the decline was so unexpected, we pursued it further.

After elimination of the non- and weak-learners the new grand mean in the negative condition is 66 TTC-10. In the positive condition it is 47 TTC-10. The number of subjects to reach criterion in fewer than the mean number of trials, and the number who needed the mean or more trials are presented in Table 10.

 Insert Table 10 about here

Table 9

McNemar Test for Significance of Changes*

Group	χ^2	p
Experimental Males	2.7	< .10
Experimental Females	17.5	< .001
Control Males	7.26	< .01
Control Females	.516	NS
Reactive Males	.25	NS
Reactive Females	8.5	< .05

* df=1

Table 10
 Frequency of Learning Scores in Relation to
 the "New" Grand Mean

Group	Negative		Positive	
	Number of Subjects		Number of Subjects	
	Below Mean	At Mean or Above	Below Mean	At Mean or Above
Experimental Males	21	10	24	7
Experimental Females	18	16	30	4
Reactive Males	30	3	21	12
Reactive Females	20	15	27	8
Control Males	21	10	26	5
Control Females	21	10	19	12

frequencies indicate that the superiority of the Reactive in the negative condition is, in fact, characteristic of the individual members of the group. The mean values, then (figure 9) representative of the groups and are not merely the result of a few learners. A histogram, Figure 10, illustrating Table 9, shows the uniqueness of the Reactive male group's learning in the negative condition.

 Insert Figure 10 about here

There are no such striking differences between the groups on the positive side of Table 9, illustrated in Figure 11.

 Insert Figure 11 about here

 Insert Table 11 about here

From Table 11 we can see that the group patterns of learning in the negative condition are different in the pathological group from the controls. If, after exclusion of the non- and weak-learners, we arbitrarily choose to consider 32 through 40 TTC-1 as slow learning, 41 through 70 TTC-10 as moderate learning, and 71 through 100 TTC-10 as fast learning, the Experimental and, to a greater extent, the Control groups have a larger proportion of learners at both extremes of the learning scale. This difference is more evident among the males than among the females. While only 45% of the Control males fell into the moderate (slow plus fast) categories, 62% of the Experimental males

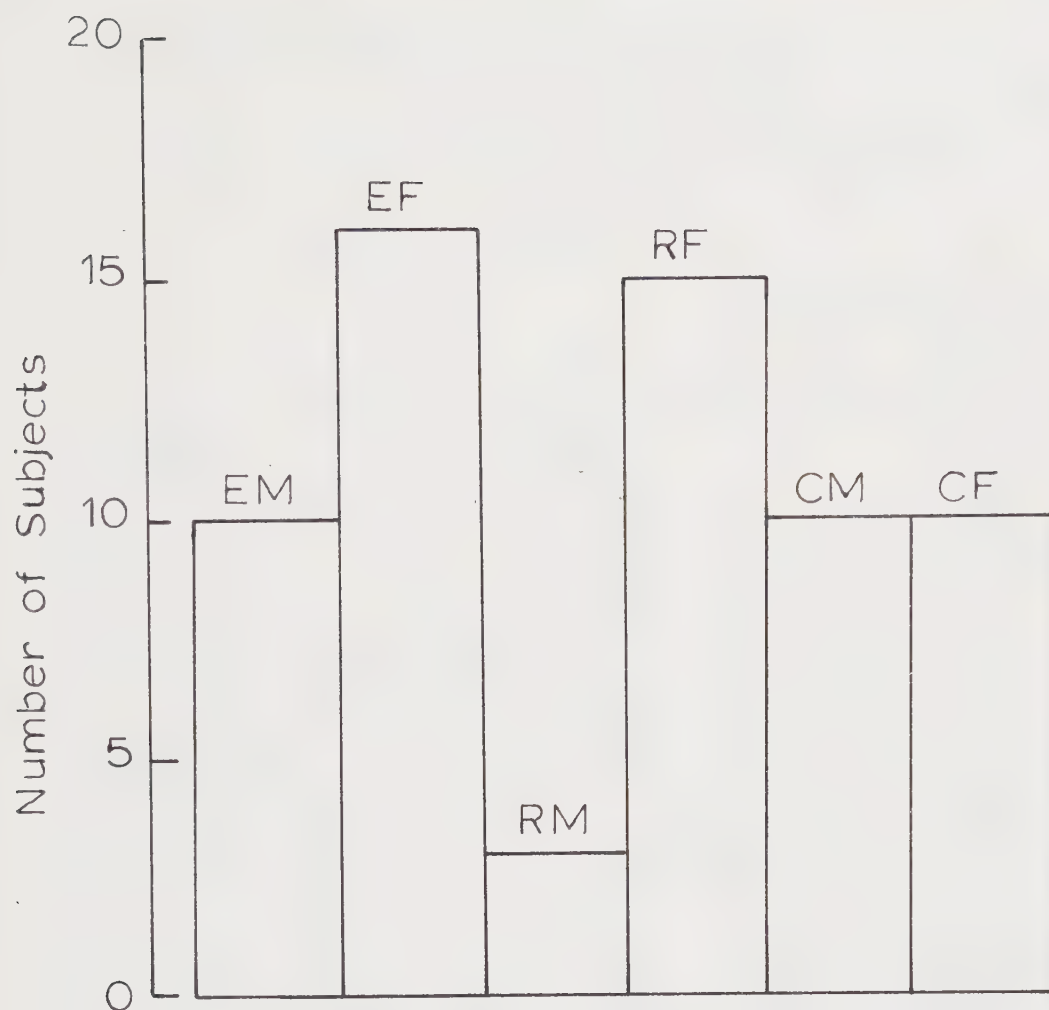


Fig. 10. Number of subjects who learned more slowly than the "new" grand mean, under negative reinforcement.

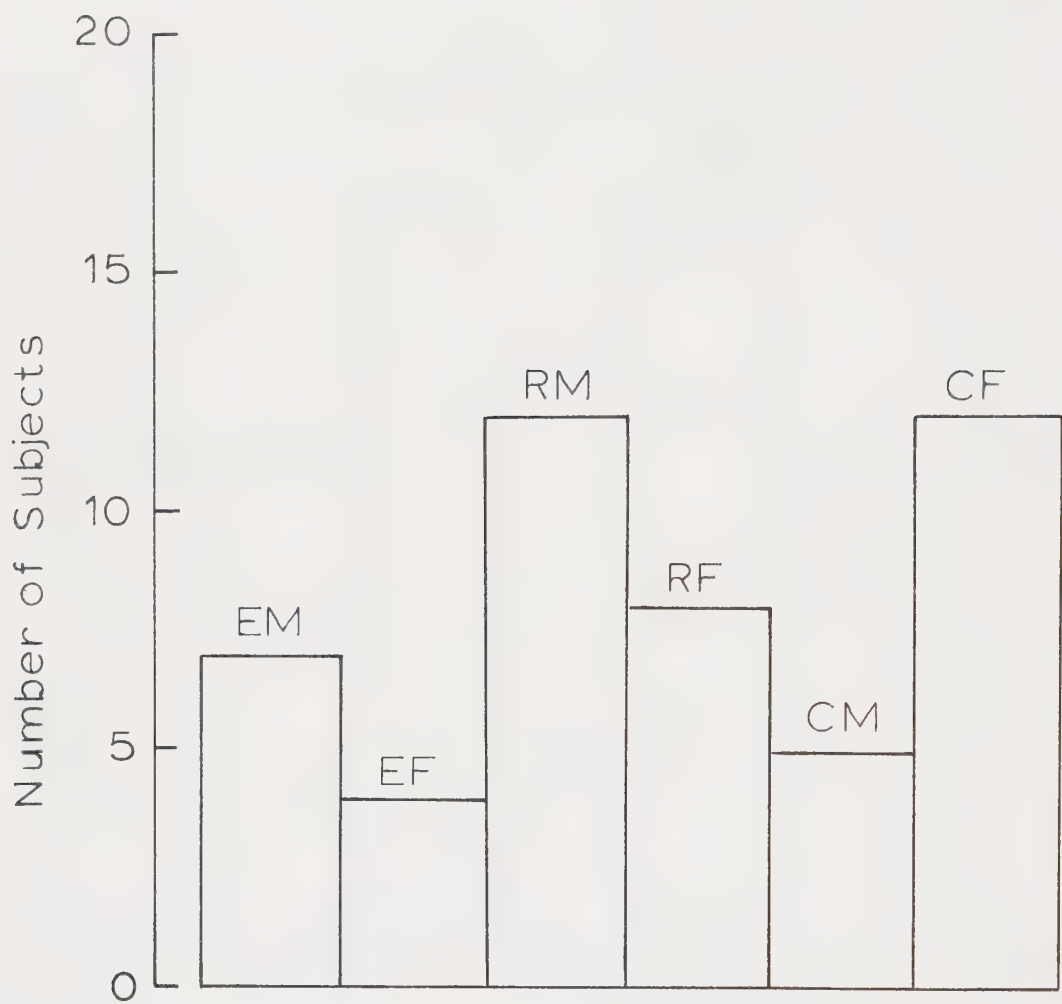


Fig. 11. Number of subjects who learned more slowly than the "new" grand mean, under positive reinforcement.

Table 11
Pattern of Avoidance Scores in the Negative Condition
(Exclusive of Non-Learners)

Group	Frequency of Scores			Percentage (%)		
	TTC-10					
	32-40	41-70	71-129	Fast	Slow	Both Extremes
Experimental Males	12	12	7	39	23	62
Reactive Males	21	9	3	64	9	73
Control Males	8	16	6	26	19	45
Experimental Females	7	13	14	21	41	62
Reactive Females	11	10	14	31	40	71
Control Females	9	13	9	29	29	58

were extreme learners, as were nearly three-fourths of the Reactive male group (73%). These group patterns are presented graphically in figures 12 and 13.

 Insert Figure 12 about here

 Insert Figure 13 about here

Alternative Measures of Learning

In an attempt to discern differences among the groups in the modes of acquisition of the correct responses the test data was re-scored and analyzed in four different ways. The first method was devised to test the hypothesis that the Experimental group, while requiring many trials to reach the criterion of ten consecutive correct responses, was learning quickly. The hypothesis suggested that Experimentals learn quickly under negative reinforcement but they are unable to maintain the correct behavior long enough to reach the criterion. We therefore lowered our standards to a criterion of merely six consecutive correct trials (TTC-6); the probability of six correct responses occurring in a row by chance is less than .05. TTC-6 reversed the direction of the difference in scores between a specially selected (Bakkestrøm, 1973) subgroup of 36 matched Experimentals and Controls in the predicted direction. That is, according to the previous TTC-10 measure, the 18 Controls were faster avoidance learners than the 18 Experimentals. But the Experimentals reached TTC-6 more quickly than the Controls (in the negative condition).

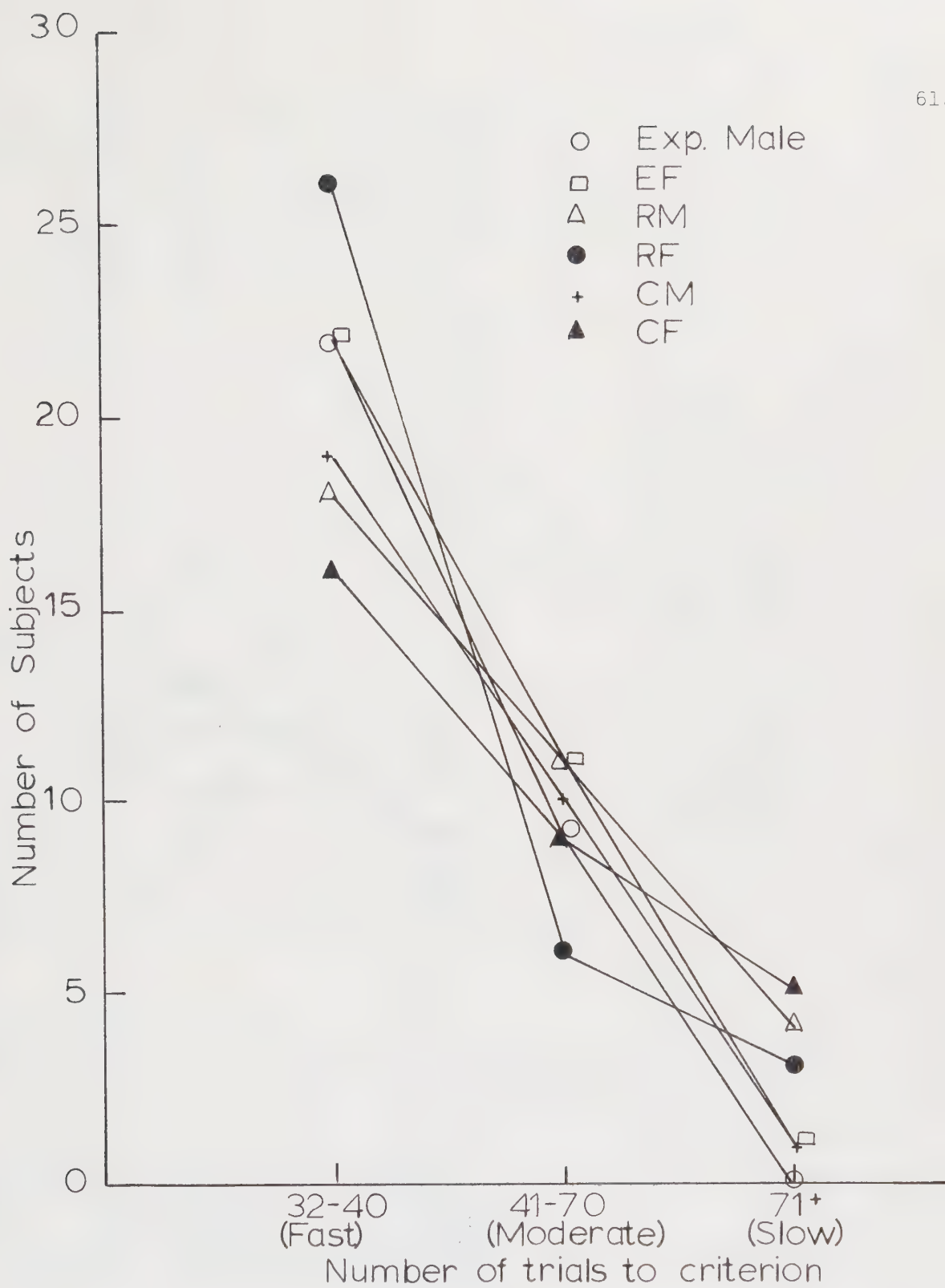


Fig. 12. Positive condition learning patterns (TTC-10), exclusive of non-learners.

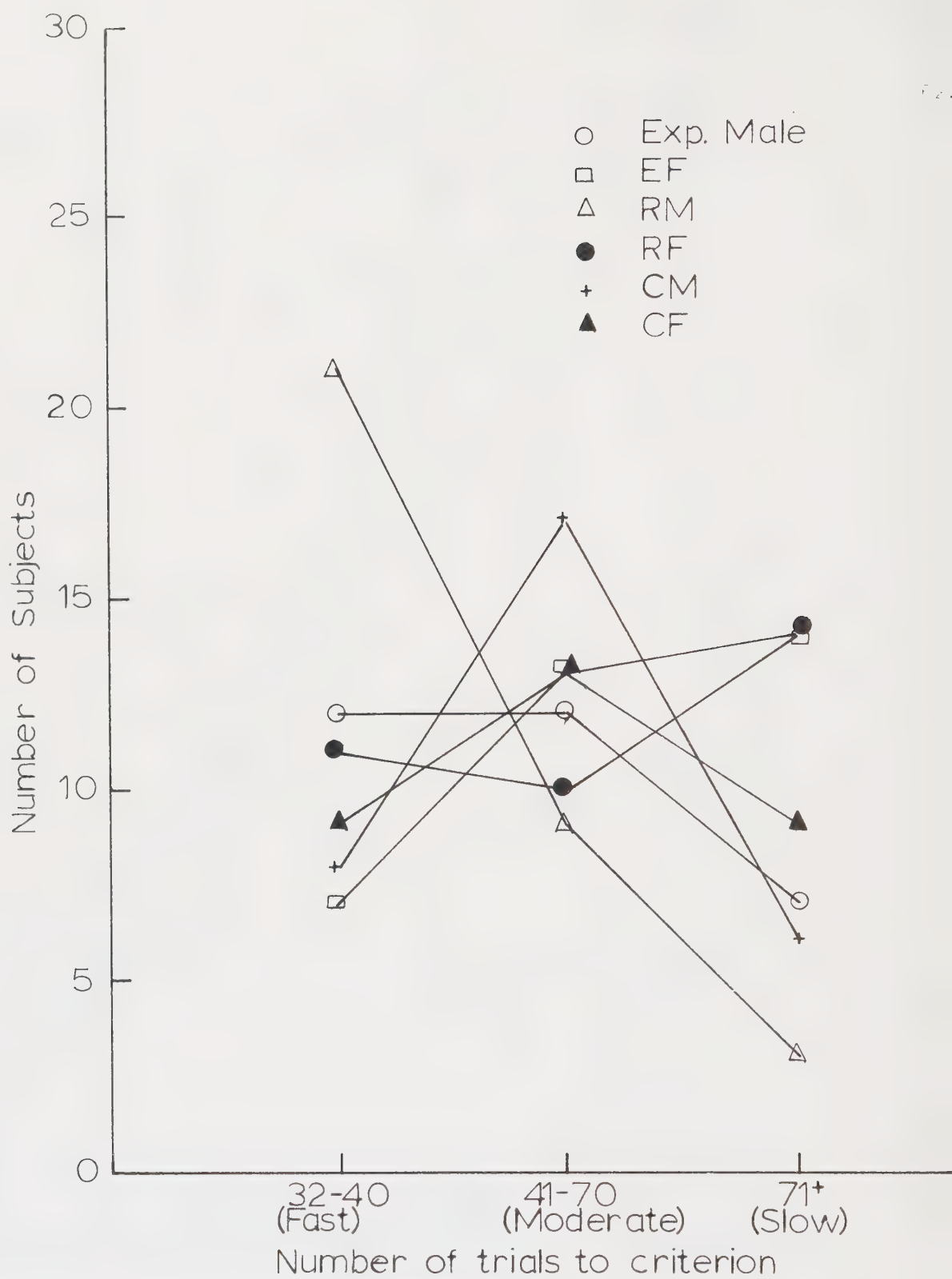


Fig. 13. Negative condition learning patterns (TTC-10), exclusive of non-learners.

On the basis of these pilot results we rescored all the data. However, the relationship of TTC-6 to TTC-10 did not hold true for the larger groups. Table 12 shows the TTC-6 results to be merely mimicking the original TTC-10 findings.

 Insert Table 12 about here

In the same vein, and for the same reasons, the data was scored according to the number of times the subject gave six or more consecutive correct responses. There were no differences between the groups on this measure.

Two purely exploratory measures were proved: 1) the ratio of correct responses to total responses, and 2) the number of "runs" (Siegel, 1956) in the first 20 trials. Both measures were aimed at discovering differences in style, approach, or method of learning among the groups. No such differences were found. The most fruitful measure was the original, TTC-10 measure.

Experimenter Perceptions

The Experimenters' impressions of the subjects were measured by the Adjective Checklist (Tables 13 and 14) which the Experimenter completed at the end of the testing day.

 Insert Table 13 about here

 Insert Table 14 about here

Table 12
Differences Between Mean (TTC-10) and
Mean (TTC-6) Scores

Group	Negative Condition			Positive Condition		
	TTC-10	TTC-6	Difference	TTC-10	TTC-6	Difference
Experimental	76	51	25	50	26	24
Reactive	69	48	21	57	35	22
Control	81	53	28	67	41	26

Table 13

Adjektivliste

1. adspredt	51. logisk	101. tungsindig
2. afbalanceret	52. loyal	102. tvangfri
3. afslappet	53. metodisk	103. udadvendt
4. afvisende	54. mild	104. udholdende
5. aggressiv	55. mistroisk	105. ukontrolleret
6. aktiv	56. moden	106. undvigende
7. alsidig	57. munter	107. uartig
8. alvorlig	58. naturlig	108. urealistisk
9. anspændt	59. nervøs	109. vagtsom
10. ansvarsbevidst	60. nysgerrig	110. varmhjertet
11. bekymret	61. nøgtern	111. vedholdende
12. besindig	62. omgængelig	112. veg
13. beslutsom	63. opgivende	113. velbegavet
14. blødhjertet	64. opmærksom	114. velopdragen
15. braldrende	65. oprigtig	115. venlig
16. charmerende	66. optimistisk	116. ægte
17. kreativ	67. ordentlig	117. ængstelig
18. drenget	68. passiv	118. ærgerrig
19. drillesyg	69. pjanket	119. ærlig
20. duelig	70. praktisk	120. åbenmundet
21. dygtig	71. pågående	121. årvågen
22. ejendommelig	72. pålidelig	
23. elskværdig	73. påskønnende	
24. energisk	74. rastløs	
25. fingernem	75. rigid	
26. fjoget	76. rolig	
27. flittig	77. samarbejdsvillig	
28. forsigtig	78. samvittighedsfuld	
29. forstående	79. selvrådig	
30. forudseende	80. selvstændig	
31. forvirret	81. selvtilfreds	
32. fraværende	82. selvusikker	
33. fredelig	83. skarpsindig	
34. frygtsom	84. småbarnlig	
35. følsom	85. snakkesalig	
36. genert	86. splittet	
37. godmodig	87. stemningslabil	
38. hæmmet	88. stridslysten	
39. højrodstet	89. stædig	
40. impulsiv	90. sund	
41. indesluttet	91. svagtbegavet	
42. indtagende	92. sårbar	
43. initiativrig	93. taktfuld	
44. klarttænkende	94. tavs	
45. klovnagtig	95. tilbageholdende	
46. koncentreret	96. tilfreds	
47. konventionel	97. tillidsfuld	
48. kvik	98. tilpasningsduelig	
49. ligetil	99. tiltrækkende	
50. livlig	100. tjenstvillig	

Table 14

English Translation of Adjective Checklist

1. scatterbrained	51. logical	101. gloomy
2. stable	52. loyal	102. informal
3. relaxed	53. methodical	103. outgoing
4. rejecting	54. mild	104. persistent
5. aggressive	55. distrustful	105. uncontrolled
6. active	56. mature	106. evasive
7. versatile	57. cheerful	107. disobedient
8. serious	58. natural	108. unrealistic
9. tense	59. nervous	109. watchful
10. responsible	60. curious	110. warmhearted
11. worried	61. realistic	111. perservering
12. poised	62. sociable	112. yielding
13. determined	63. gives up easily	113. intelligent
14. soft-hearted	64. attentive	114. mannerly
15. blustery	65. sincere	115. friendly
16. charming	66. optimistic	116. unaffected
17. creative	67. orderly	117. anxious
18. boyish	68. passive	118. ambitious
19. teasing	69. silly	119. honest
20. capable	70. practical	120. indiscreet
21. skillful	71. officious	121. alert
22. peculiar	72. reliable	
23. kind	73. appreciative	
24. energetic	74. restless	
25. handy	75. rigid	
26. foolish	76. calm	
27. industrious	77. cooperative	
28. cautious	78. conscientious	
29. understanding	79. headstrong	
30. farsighted	80. independent	
31. confused	81. self-satisfied	
32. preoccupied	82. insecure	
33. peaceful	83. shrewd	
34. timid	84. infantile	
35. sensitive	85. talkative	
36. shy	86. divided	
37. good-natured	87. moody	
38. inhibited	88. quarrelsome	
39. loud	89. stubborn	
40. impulsive	90. healthy	
41. withdrawn	91. unintelligent	
42. charming	92. touchy	
43. has initiative	93. tactful	
44. clear-thinking	94. silent	
45. clownish	95. retiring	
46. able to concentrate	96. contented	
47. conventional	97. trusting	
48. quick	98. adaptable	
49. unsophisticated	99. attractive	
50. lively	100. helpful	

The Experimenter went through the entire list of adjectives, placing a "1" alongside those adjectives he considered appropriate to the subject, and a "2" next to those adjectives which were not fitting. The ACL was scored "blind," i.e., with no knowledge of the subject's group designations. For the purposes of the present analysis the Experimenter who administered all the Avoidance tests ranked the adjectives on a scale of 1 to 3. "1" was an adjective having a negative connotation, "2" was neutral, and "3" indicated a positive adjective. This original scale was transposed to -1, 0, and +1, with "0" as neutral for greater clarity.

The number of times each adjective was chosen for each group was counted. Males and females were treated separately because of the possibility of the Experimenter (himself a male) having different standards for males and females. Table 15 presents the adjectives chosen for at least two-thirds of the subjects in the group. Items which were characteristic of all groups (i.e., were chosen for two-thirds of the subjects in all six groups presented) were deleted.

Insert Table 15 about here

According to the total weights of the adjectives in Table 15, the Control and Reactive males are more pleasing to the Experimenter than the other groups. The Control females, whose negative characteristics cancel out their positive traits, please him the least. There are no purely sex-typed items, i.e., there are no adjectives characteristic of all three groups of either sex that are not characteristic of at least one group of the opposite sex. Nevertheless, we compiled a list of the items (and their weights) unique to one of the three same-sexed

Table 15

Items Characteristic of at Least Two-Thirds of
the Group and Not Shared by All Six Groups

<u>Experimental Males</u>	<u>Weight</u>	<u>Experimental Females</u>	<u>Weight</u>
cautious	0	peaceful	0
relaxed	+1	attractive	+1
serious	-1	cautious	0
good-natured	0	charming	+1
quick	+1	relaxed	0
insecure	-1	serious	-1
retiring	-1	good-natured	0
alert	+1	quick	+1
outgoing	+1	retiring	-1
	<u>+1</u>	outgoing	+1
		healthy	+1
		trusting	+1
			<u>+4</u>
<u>Control Males</u>		<u>Control Females</u>	
charming	+1	retiring	-1
active	+1	healthy	+1
good-natured	0	trusting	+1
quick	+1	attractive	+1
lively	+1	silent	-1
cheerful	+1	peaceful	0
outgoing	+1	cautious	0
trusting	+1	shy	-1
	<u>+7</u>	charming	+1
		relaxed	0
<u>Reactive Males</u>		serious	-1
good-natured	0	cheerful	+1
peaceful	0	insecure	-1
charming	+1		<u>0</u>
quick	+1		
cautious	0		
lively	+1	<u>Reactive Females</u>	
retiring	-1	healthy	+1
alert	+1	attractive	+1
outgoing	+1	peaceful	0
healthy	+1	charming	+1
trusting	+1	relaxed	0
attractive	+1	quick	+1
	<u>+7</u>	cautious	0
		lively	+1
		insecure	-1
		retiring	-1
		alert	+1
			<u>+4</u>

groups. That is, we compared the three female groups and noted the items which were characteristic of only one group, as well as noting the absence of a characteristic from one group if it were present in the other two. The male groups were compared in the same way, and the resulting lists are presented in Table 16. The absence of a trait ranked +1 is weighted -1, and vice versa. The absence of a neutral trait is equally neutral and is thus weighted zero.

Insert Table 16 about here

The total weights displayed in Table 16 indicate that the Experimental males and the Control females made the least favorable impressions on the Experimenter. The pattern of the adjectives suggests a rather withdrawn and inhibited picture. In contrast, the traits chosen for the Experimental and Reactive females, and the Control males suggest a picture of reaching-out to the environment with words like "alert" (Reactive females), "outgoing" (Experimental females), and "active" (Control males).

The three unique Reactive male characteristics seem to be qualitatively different from those of the other groups in that they are more descriptive of the subjects' appearance than of their behavior.

Experimenter bias, as a concept inferable from the analysis of the Adjective Checklist, cannot be considered predictive of group performance on the Avoidance test. But the Experimenter's subjective judgment in Table 16 gives us some insight into the behavior depicted in Figure 9. In the latter figure we see that the three groups who learned most poorly under negative reinforcement are the Experimental

Table 16

Adjective Checklist Items and Their Weights

Unique Among Males		Unique Among Females	
	Weight		Weight
<u>Experimentals</u>		<u>Experimentals</u>	
relaxed	+1	good-natured	0
serious	-1	outgoing	+1
insecure	-1	not insecure	+1
not charming	-1		
not lively	-1		
not trusting	-1		
Total	-4	Total	+2
<u>Controls</u>		<u>Controls</u>	
active	+1	shy	-1
cheerful	+1	silent	-1
not retiring	+1	not quick	-1
not alert	-1		
not cautious	0		
Total	+2	Total	-3
<u>Reactives</u>		<u>Reactives</u>	
peaceful	+1	alert	+1
healthy	+1	lively	+1
attractive	+1	not trusting	-1
		not serious	+1
Total	+3	Total	+2

and Reactive females, and the Control males. These are the same groups whose descriptions, according to the Adjective Checklist (Table 16), indicate attention to, or openness toward, the environment. If these subjects are attending more closely to the environment than the others, they would be more susceptible to its whims, and more sensitive to its changes. Thus, for them, our Experimenter's "no" was a disruptive element, an impediment to learning. The removal of censure and the substitution of approval in the positive condition again has the greatest impact on these same three groups. This is illustrated in Figure 9 by the tremendous improvement in the performance of the Reactive and Experimental females from the negative to the positive condition. Perhaps these female subjects were even more vulnerable in the Avoidance test because the Experimenter was male. The slope of the Control male's line is not quite as dramatic, but is still substantial.

Reactive Males. Because of its heterogeneous nature, the Reactive group lends itself to analysis by clinical subgroup. A comparison of the Avoidance test performance of the Reactive males on the basis of a psychiatrist's evaluation of the presence or absence of psychopathy in the parents is presented in Table 17.

Insert Table 17 about here

The diagnosis of psychopathy in the parent does not seem to be related to the speed of negative learning in the child; the two groups are not statistically different from one another. However, five of the eight sons of psychopathic fathers learned faster in the negative condition than under positive reinforcement; only one learned

Table 17

Learning Patterns of Reactive Males

Who Have a Psychopathic Father

Reactive Males	Number of Subjects		
	Faster in Negative	No Difference	Faster in Positive
With Psychopathic Fathers	3	2	1
With Sick* Mothers and Psychopathic Fathers	2	0	0
With Sick* Mothers Only	7	6	7
With Sick* Mothers and "Doubtful Psychopathic" Fathers	1	2	1

* The mothers' diagnoses do not include psychopathy.

with fewer trials in the positive condition than in the negative.

Intelligence and Avoidance Learning. Five subjects of the Wechsler Intelligence Scale for Children (WISC) were administered: Similarities, Vocabulary, Block Design, Object Assembly, and the Maze. Analysis of variance of the scale scores was performed, and the results are presented in Table 18.

 Insert Table 18 about here

Table 18 shows significant differences among the groups in their scores on the Vocabulary subtest, and on Similarities, the two verbal subtests. In each case the Controls scored highest, Reactives next, and Experimentals had the lowest scores. There is no sex effect. Table 19 presents the group scale score means for all subtests as well as verbal, performance, and total I.Q. scores.

 Insert Table 19 about here

The differences among the groups in total I.Q. scores is just less than the .05 level of significance. The means, however, reflect the differences in verbal I.Q., with the highest mean I.Q. in the Controls, the lowest in the Experimentals.

It is clear that performance on the Avoidance Test is not merely a function of I.Q.

The Order Effect

A major difficulty in the interpretation of the results of the Avoidance Test is the influence of the order effect on the independent

Table 18
 Analysis of Variance
 WISC Scale Scores

Subtest	df	S ²	M ²	F	p
Similarities	2,210	36.0833	18.041	3.36	< .05
Vocabulary	1,210	87.4445	43.722	4.66	< .01
Block Design	2,210	6.7500	3.375	0.37	NS
Object Assembly	2,210	0.0648	0.032	0	NS
Maze	2,210	30.1111	15.055	1.94	NS
Verbal I.Q.	2,210	2328.4475	1164.223	4.90	< .01
Performance I.Q.	2,210	254.3975	127.198	0.47	NS
Total I.Q.	2,210	1290.6772	645.338	2.96	NS

Table 19
WISC Scale Score Means

Group	Subtest					Ver-	Perfor-	Total
	Similar- ities	Vocab- ulary	Block Design	Object Assembly	Maze	bal I.Q.	mance I.Q.	
Exper. Males	9.53	9.72	11.69	12.39	9.39	98	108	103
Exper. Females	10.00	9.97	11.78	12.22	9.47	100	109	105
React. Males	10.22	10.39	11.56	12.19	10.00	102	109	106
React. Females	10.39	10.69	11.92	12.44	10.47	103	111	108
Control Males	10.75	11.03	11.86	12.28	10.36	106	111	109
Control Females	10.78	11.78	12.36	12.28	10.05	108	111	110

variables of positive and negative reinforcement. The negative condition was always administered first; thus any interpretation based on within-group differences between positive and negative learning must be tentative because the variables of reinforcement and practice are confounded. This confounding of variables was known when this project was designed, but, in view of the long-term goals of the entire high-risk project, it was considered to be unavoidable. The final phase in this method of longitudinal study is to compare the subjects who become schizophrenic to their matched controls as well as to those other Experimental subjects who did not develop overt psychopathology. Since we were unable to predict which of the Experimental children would eventually succumb to schizophrenia, it is imperative that all subjects experience exactly the same procedures. Only in this way will it later be possible to compare particular high-risk individuals.

In an attempt to measure the pervasiveness of the order effect, 24 additional subjects were run (the "order effect control group"). These were 12 girls and 12 boys between 10 and 13 years of age who attended a local school. Half of the order effect control group received the positive condition first, and half received the negative condition first, in a counterbalanced design. As can be seen in Table 20, the order effect is evident, especially among the girls. The sex difference observed here is sufficient to invalidate the assumption of constancy in the order effect, whether across individuals, sexes, or groups. The existence of the unknown quantity of order effect indicates caution in our interpretation of positive-negative differences, but our between-group data in the negative condition is uncontaminated by the order effect. Negative

reinforcement and learning is our primary interest; therefore, greater emphasis will be placed on the negative condition in discussing the results of the present study.

Insert Table 20 about here

Table 20
Schoolchildren Controls for Order Effect

Sex	Positive First			Negative First		
	Positive Faster	Negative Faster	Same Speed	Positive Faster	Negative Faster	Same Speed
Male	2	2	2	1	2	3
Female	1	3	2	4	0	2
Total	3	5	4	5	2	5

Chapter IV

DISCUSSION

In the context of a developmental approach to the study of psychopathology, it was hypothesized that children who are susceptible to schizophrenia would show a sensitivity to aversive stimuli different from that of children who are not at risk for the disorder. The present investigation, using the Experimenter's "yes" and "no" as social reward and punishment, respectively, did not find the predicted differences. Children at high risk for schizophrenia as a group were found to be neither better nor worse avoidance learners than low-risk children or than children at high risk for other psychopathologies.

The differences found in avoidance learning were of a more complex nature than hypothesized. The meaningful subject groupings for avoidance learning were parental psychopathology versus no parental psychopathology, and males versus females. The results appeared to form a pattern of extremes in the psychopathologic (Experimental and Reactive) groups, and moderation in the Controls. Extremes -- the pathological females were the slowest learners in the negative condition. They learned significantly more slowly than their male counterparts. This large sex difference was not found in the Control group. Reactive males were the fastest avoidance learners; again, an extreme. Even within the psychopathologic male grouping we found a pattern of extremes. When compared with Control males,

the pathologic male groups had more subjects who fell into the extreme categories of very fast or very slow learning.

The phenomenon of punishment itself is complex in nature. On the basis of the literature, we would expect that punishment, when administered in an avoidance paradigm such as ours, would facilitate learning (Brackbill and O'Hara, 1958; Meyer and Offenbach, 1962; Meyer and Seidman, 1960; Penney and Lupton, 1961; Penney, 1967). However, there is another side to punishment, the "dark" side, which asserts itself as well. Punishment is disruptive. Punishment is distracting (Farber, 1955) and arouses fear responses which can interfere with, and thereby impede, learning. Marshall (1965) tried to reconcile the two sides of punishment by suggesting that whether punishment enhances or disrupts learning may depend on other factors in the situation, for example, strength of negative reinforcement, task difficulty, and achievement orientation.

We have seen (Streiner, 1969) how task difficulty influences the differential effect of negative reinforcement on schizophrenics and normals (see Chapter I, p. 14). It is but one of the task variables that have been found to play a determining part in the effect of punishment on performance. Marshall's (1965) suggestion of achievement orientation as a possibly pivotal factor in the disruptive or facilitative effect of punishment on learning was well founded. The achievement motivation of young experimental subjects was indeed found to influence reinforcer effectiveness. Blair (1972) tested 30 low-achieving and 30 normal-achieving third grade boys on a size discrimination learning task. Three types of positive reinforcement were used: 1) tangible reward, 2) personal praise, and 3) praise of the subject's performance. The normal-achievers

learned better with praise than with tangible reinforcement. Low-achievers, on the other hand, showed better learning under tangible reinforcement than in either of the two praise conditions. Surprisingly, the low-achieving children did as well with tangible reward as the normal-achievers did with personal and performance reinforcement. Thus, the different levels of achievement reached by the two groups of schoolboys in this experiment were not related to differences in their abilities, but rather to differences in the appropriateness of the available reinforcers, or differential reinforcer effectiveness. With our subjects, too, it is clear that differences in avoidance learning were not due to differences in ability. There was no significant sex effect in the distribution of the WISC scores, nor did the group differences in the WISC mimic the performance of the groups on the Avoidance test. Just as in the Blair study, we cannot account for differences in learning on the basis of intellect. But we see that other characteristics of the subject, like achievement motivation, can be of great importance in determining the effect of reinforcement on that subject.

There are other such characteristics that a subject brings with him to the experimental situation. The most pervasive of these individual characteristics is his own personal history of reinforcement. His previous experience with reward and punishment influences his perception of and response to the reinforcers in the experimental task. In a recent review of the literature on the effectiveness of social approval as reinforcement, Eisenberger (1970) showed that the efficacy of social approval increases with prior deprivation of approval and decreases with satiation, much in the manner of tangible positive

reinforcement. However, in the studies reviewed by Eisenberger deprivation or satiation of social approval was experienced by the subjects only over the short period of time immediately preceding the experimental task, and we can only tentatively extrapolate from this data to the developmental effects of exposure to social approval. More recently, Hamilton (1972) combined naturalistic observation with experimental manipulation in a creative attempt to observe the longer-term effects of reinforcement history. Twelve male and 12 female preschool children were observed in a nursery school setting. Social reinforcements received from adults in twelve three-minute observations of each child's nursery school interaction were recorded over a four-week period, and a tendency for girls to receive more social reinforcement than boys was found. The six boys and six girls who received the most social reinforcement composed the high reinforcement standard group, and the six boys and six girls with the lowest number of observed social reinforcement were the low reinforcement standard group. The children were given a discrimination task with social reinforcement ("That's right") for the correct choice. Significant differences between the high and low reinforcement standard groups were found. Just as in the studies reviewed by Eisenberger, social reinforcement in the experimental task was more effective with the low-reinforcement-standard (i.e., the deprivation) group than with the high-reinforcement-standard (satiation) group.

Thus, withholding or offering approval affects the motivation for obtaining approval, not only as an immediate consequence, but also over an extended period of time.

On the basis of the Hamilton and Eisenberger works we would predict that children raised in a punitive environment would be less affected

by punishment in an experimental situation than children raised under non-punitive conditions. According to self-reports, girls are reared with less negative reinforcement than boys. Girls, as compared with boys, report their parents to be more affectionate and less rejecting and hostile (Droppleman and Shaefer, 1961). From these self-reports we may infer that female children are exposed to more positive social reinforcement, or less punishment, than male children. The differences in reinforcement histories would have an effect in the context of the Avoidance Test by adding to the impact of the negative reinforcement on the girls as compared with the boys. And, in fact, we found the girls to be more disrupted by punishment than the boys. This was particularly true in the pathologic groups.

In addition to reinforcement history, other subject variables or personality factors have been found to be related to reinforcer effectiveness. Two of these measures, extraversion-introversion and field dependence, have been found to vary systematically with sex and psychopathology as well. The demonstrated relationship of these measures with psychopathology or sex and reinforcer effectiveness makes them useful constructs for the interpretation of our results.

Introversion-Extraversion and Reinforcement. In his extensive work on the continuum of introversion-extraversion Eysenck (1964) has found greater sensitivity of introverts than extraverts to negative reinforcement. This was discovered in schoolchildren as early as 1937. Forlano and Axelrod (1937) concluded that the use of criticism would generally lead to better classroom performance than would praise. However, in a letter-cancellation task they found that introverted children improved both the first and the second times they were criticized, while extraverts showed no improvement until after the

second time they were criticized.

Field Dependence and Reinforcement. The dimension of field dependence/field independence and its relationship to reinforcement was investigated by Randolph (1971). He chose 180 field dependent and field independent fifth grade boys on the basis of their performance on the Children's Embedded Figures Test. The experimental anagrams task was administered in two parts. Following the first part: 1) one-third of the subjects were praised, 2) one-third were criticized, and 3) one-third were given nine insolvable anagrams with no comment (this was the failure condition). Randolph found praise and criticism to have greater differential effects on the field dependent boys than on the field independent boys. Field dependents did more poorly than field independents following both failure and criticism conditions.

The findings of this study will be approached through two personality measures, field dependence and introversion-extraversion. The greater field dependency generally found in girls (Witkin, et al., 1972) could be a factor in their poor performance under negative reinforcement and their good performance in the positive condition. The analysis of the Adjective Checklist showed attention to or openness toward the environment to be characteristic of the two female pathological groups who showed the most profound differential effects of negative and positive reinforcement. As compared with the others, the pathological females learned most poorly under punishment and showed the greatest improvement in the praise condition. An attentive attitude toward the environment might suggest behavioral field dependence, which would be in line with the results of Randolph (1971). Field dependence sex differences have been found to be exaggerated in the presence of psychopathology, and our psychopathologic

females are manifesting the most evidence of field dependence, both in their learning and according to the impression they made on the experimenter.

The dimension of extraversion-introversion is a frame of reference in which we can understand the performance of the psychopathologic males in general, and the Reactive males in particular. Reactive males, learning quickly in the negative condition, seem to be impervious to the disruptive effects of punishment. Their insensitivity to punishment fits very well with Eysenck's (1964) and Hare's (1970) descriptions of psychopathic behavior. While the Reactive males are not psychopaths,* they are at high risk for psychopathy because of the presence of psychopathy in some of their parents. Eysenck's (1964) model places psychopaths near the extravert end of the extravert-introvert continuum. He reports that extraverts in general have greater pain tolerance than introverts. Hare (1970), speaking of psychopaths in particular, reports that they have a higher shock-detection threshold than non-psychopaths. Hare suggests that the lower cortical excitability found in psychopaths may be related to the "gating out" of sensory input which would have disturbing consequences. This investigator understands the "gating out" process to be somewhat analogous to the "tuning out" response of a normal adult at a dull cocktail party. Although "tuned out," the party guest can deal with

* This Reactive male group has a genetic and/or environmental input of psychopathy not present in the other male groups; and although the Reactive females have this input, too, psychopathy is rarely diagnosed in females.

enough information stimuli to emit the appropriate social responses. His emotional investment may, however, be nil. In a similar manner, the Reactive males can be said to be selectively "gating out" the emotional, disruptive elements of the reinforcement while benefiting from its cognitive or information value. Hare's (1970) "gating out" construct could be applied to the phenomenon of poor learning in psychopathologic females under punishment. They are not "gating out" the reinforcement and are disrupted by it. The females do eventually learn, but slowly, with difficulty. Reactive and Experimental females seem to lack the apparent selectivity of their male counterparts.

At this point we must view our interpretation of sex differences with caution. Sex differences on introversion-extraversion and field dependence dimensions shed light on our findings, but their explanatory usefulness is limited and leaves room for other possibilities. The observed improvement in psychopathologic females from the negative to the positive reinforcement conditions, for example, may be explained as simply reflecting a differential effect of practice alone on learning in males and females. What reason have we to assume an equal effect of practice on all subjects? Practice was found to affect the performance of boys and girls in quite different ways in a study by Bergan, McManis and Melchert (1971). They matched 24 male and 24 female fourth-grade children on their pretest ability on the WISC block design subtest. They then retested the children on the Block Design under one of the following conditions: 1) token reinforcement, 2) social reinforcement, and 3) control. Girls and boys showed different patterns of improvement in speed and accuracy in the experimental conditions. Boys showed significant gains in speed only under social reinforcement and significant gains in accuracy

only under token reinforcement. While the girls' accuracy improved significantly more than the boys' under social reinforcement, the boys had significantly greater gains in speed than the girls. The girls showed gains in accuracy and losses in speed under all three treatments (including control). Thus, while the boys' WISC block design performance was clearly affected by reinforcement, the same cannot be said for the girls. The most pervasive factor for the girls in this investigation seemed to be the practice effect; their performance both improved in accuracy and deteriorated in speed over time. The performance of females seems to be more influenced by practice than the performance of males, but the direction of this influence is not clear.

The girls in our order effect control group also improved with practice. Since the Avoidance Test scores are more a measurement of accuracy than of speed, our findings are in line with the Bergan, McManis and Melchert (1971) findings above.

Thus, if girls tend to be more influenced by practice than boys, and if normal male-female differences tend to become exaggerated in the presence of psychopathology (Witkin et al., 1972), it is possible that the improvement of the Experimental and Reactive females from the negative to the positive conditions is simply a function of practice. Nevertheless, their greater susceptibility to the practice effect may be seen as a further indication of their openness to the environment, or their field dependency. Practice is a variable in the environment, and the psychopathologic females are more responsive to it than the other subjects.

Recapitulation

We have seen in the literature that males are generally more field-independent than females, and that they are reared with less social approval. Each of these factors has been shown to correlate with a lesser sensitivity to the disruption of aversive stimuli; and from this we postulate a greater insulation of males from the disruptive effects of punishment. That is, we would expect males to learn more quickly under negative reinforcement than females who are more vulnerable to the disruption of aversive stimuli. We found this to be true for the psychopathologic groups; the males did learn more quickly than the females under punishment. Our explanatory construct of insulation from the disruptive emotional effects of punishment is lent support by the fact that there is a tendency for the males to report having used some strategy in choosing their responses more often than the females. The presence of mind necessary to consider response strategies could indicate a degree of emotional calm and task-orientation in the subject.

Further support for the "insulation" construct can be found in the results of the Adjective Checklist. The experimenter chose adjectives indicating sensitivity to the environment to describe the psychopathologic females, not the psychopathologic males. One explanation for this rating of the pathological females as more sensitive than the males might be that the pathologic females lack the insulation of the males from the emotional effects of punishment. Their learning was severely disrupted in the negative condition.

Perhaps it is the same apparent openness and sensitivity to the environment that accounts for the significant improvement of the

Reactive and Experimental females in the positive condition. Although we cannot be sure that the greater improvement of the psychopathologic females (as well as that of the Control males) is not simply a function of a greater practice effect, it has been noted earlier that relief from a distressing situation in which punishment is administered enhances learning by increasing the motivation to seek approval. A likely explanation for the behavior of the psychopathologic females under positive reinforcement is some combination of the factors 1) practice, and 2) increased potency of the positive reinforcement due to its contrast with the highly disruptive negative reinforcement immediately preceding.

The decrement in the learning of the Reactive males in the positive condition relative to the negative condition is difficult to understand. Although this decrement is not statistically significant, it is surprising, for we would expect (and, in fact we observe in the other groups) some improvement in the second task due to practice alone. We can try to look at the phenomenon of the Reactive males in terms of Eysenck's (1964) extraverts. The Reactive males are likely candidates for the extravert classification because of the presence of psychopathy in some of their parents, as well as their maleness in a society that permits, and even encourages, extraverted behavior in boys. Eysenck noted a stimulus hunger in extraverts and a consequent indulgence in stimulus-seeking activity. Similarly, he reported the poor performance of extraverts on vigilance tasks and a low threshold for boredom. It may well have been their short attention span in dull tasks that was responsible for the poor performance of the Reactive male group under positive reinforcement. As we noted above, negative reinforcement did not appear to have an

emotional effect on the Reactive males. They simply used the information-feedback of the reinforcement and learned the discrimination. Then, when the Reactive males were confronted with a very similar task in the positive condition, and with the positive reinforcement diluted by the neutrality of the preceding reinforcers, their attention may have dissipated along with their motivation, and poorer performance resulted.

Conclusions and Implications for Future Research

The unexpected nature of our findings led us to search the literature for some supporting structure, most preferably a holistic model in which our results would fit and make sense. We were unable to find that model, and it appears that the results of this study have produced more questions than they have answered.

It is clear, however, that the controversy over censure-deficit versus censure-enhancement theories is quite beside the point in the developmental perspective of schizophrenia. Particular sensitivity to negative reinforcement is not characteristic of children at high risk for schizophrenia, that is, it is not a developmental forerunner specific to schizophrenia. While sensitivity to censure is manifested in behavior disorders, it is not specific to certain diagnostic categories. A recent investigation of the censure-deficit model (Wagener and Hartsough, 1974) found it to be related to low social competence, but not to the diagnostic categories of schizophrenia, alcoholism, or normals. Perhaps that has been the source of confusion -- schizophrenics with low social competence perform poorly with censure, but the more socially competent do not. The dimension of social competence bears further investigation.

The large and significant difference between the male and female psychopathologic groups in the present investigation raises important questions concerning current practice in experimental psychopathology. Too often sex is ignored as a variable in the research. Results obtained with a group of subjects of one sex are generalized to the other. In the present study, males and females in the same diagnostic groups were found to be radically different from one another. Perhaps different theories need to be developed to account for the process of psychopathology in each sex. Even if separate theories do not prove necessary, we cannot be satisfied with generalizations from one sex to the other in psychopathology research.

Ramifications of the large sex difference extend in other directions as well. The exaggeration of behavioral differences between the sexes in the presence of psychopathology has been observed, and in the present study we see that the divergent male-female patterns have already begun for our subjects long before many of them will be considered sick. We must wait until some of them begin to show signs of maladaptive behavior before we can say whether the patterns of responding studied here are indeed predictive of psychopathology or are merely characteristic of a vulnerable population without being indicative of future pathology.

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Appendix A

Life Events and Breakdown in a Group of Subjects at High Risk for Schizophrenia

Approximately 2-4 years after the initial (1962) examination of a sample of children at high risk for schizophrenia, the subjects were interviewed by a social worker. The present study is based on that interview and is in two parts. Part I is an examination of the pre-coded social worker interview to discern the differences between the way the high-risk group and the low-risk group answered the social worker's questions concerning various aspects of life, e.g., education, work, and interpersonal relations.

Part II deals with a subgroup of the high-risk group. Twenty high-risk subjects (the Sick group) suffered some kind of psychiatric difficulty between 1962 and 1967. These were matched with 20 high-risk subjects who had not broken down (the Well group), and 20 low-risk controls (the Control group).

The analyses reported thus far (Mednick and Schulsinger, 1968b) have examined characteristics of the Sick subjects looking for early predisposing factors. In this study we searched the social worker's notes on the interviews for recent factors in the lives of the Sick subjects which might have contributed to their psychiatric problems. It should be pointed out that the interview was not originally designed specifically for this study. On the basis of research by Brown and Birley (1968) it was hypothesized that the Sick subjects will have experienced more significant events immediately prior to their breakdown.

Method

Subjects

The 293 subjects in the present investigation included 196 high-risk and 97 low-risk subjects tested in the Mednick-Schulsinger study. Eighteen subjects from the 1962 sample were not included because of incomplete interviews. The high-risk group was comprised of 112 males and 84 females. The low-risk group was comprised of 59 males and 38 females. The mean age of the subjects at the time of the interview was 17.9 years. High-risk and low-risk subjects were matched on sex, age, father's occupation (the best measure of social class in Denmark; Svalastoga, 1959), rural-urban residence, years of education, and institutional upbringing versus family life.

Twenty of the high-risk subjects manifested abnormal behavior in 1967 (the Sick group). These were matched with 20 other high-risk subjects on the variables of age, socio-economic status, and the psychiatrist's rating of level of adjustment at the time of the initial assessment. An additional restriction was imposed; the high-risk controls (the Well group) must have either maintained or improved their level of adjustment since the initial assessment. Twenty matched subjects from the low-risk group comprise the Control group. More information on these groups (including symptom descriptions) may be found in Mednick and Schulsinger (1968b).

Procedure

The subjects and their parents were interviewed in their homes by a social worker using a precoded interview. A mean interval of 2.8 years lapsed between the first (1962) examination and the followup

interview (range: 1.5 - 4 years). The interview covered the following areas: marriage, living conditions, parents, family, friends, education, occupation, health, spare time, and affect.

Results

High-Risk and Low-Risk Groups

The responses to each of the questions in the precoded interview were tallied and chi-square analysis (with Yates's correction) of the high-risk group versus the low-risk group were completed. Of 120 items tested, 14 were significant; these are presented in Table 1.

Insert Table 1 about here

According to the interview, high-risk children tend more to have unsatisfying peer relationships; they consider their peers a source of trouble. There is no evidence of other interpersonal relationships to compensate for the problematic peer relationships; we see an absence of contact between high-risk Ss and their parents.

The high-risk Ss consider themselves to be victims of bad luck; they admit to feeling nervous without reason. Their nervousness is corroborated by the interviewer, who finds their interview uncomfortable, with S expressing himself vaguely and unclearly.

Evidence of the high-risk group's instability is their erratic residential and employment histories.

Sick, Well, and Control Groups

When we looked at the responses of the Sick, Well, and Control groups on these same items, only one item reached significance. The

Table 1

Item	% Yes		χ^2*	df	p
	High-Risk	Low			
<u>S</u> has unstable employment history.	6	2	5.4562	1	< .02
<u>S</u> has unstable resident history.	19	7	5.9699	1	< .01
<u>S</u> doesn't know mother or has no contact with her.	26	5	10.1083	1	< .01
<u>S</u> doesn't know father or has no contact with him.	24	8	9.3662	1	< .01
<u>S</u> has a negative attitude towards his mother.	65	37	13.5272	1	< .001
<u>S</u> feels he has experienced more bad luck than usual.	22	4	14.5971	1	< .001
<u>S</u> blames his mother as a source of difficulties.	23	11	4.6289	1	< .05
<u>S</u> blames his peers as a source of difficulties.	21	11	4.005	1	< .05
<u>S</u> feels nervous without reason.	15	3	4.9144	1	< .05
<u>S</u> was very nervous at the beginning of the interview.	38	14	15.4676	1	< .001
<u>S</u> did not get more calm as the interview progressed.	18	3	11.3154	1	< .001
<u>S</u> expresses himself vaguely.	22	8	7.9809	1	< .01
<u>S</u> does not express himself clearly.	25	13	4.7298	1	< .05
Interview did not have a comfortable course as judged by interviewer.	27	12	7.5637	1	< .01

* Two-tailed test, Yates correction used.

Sick group felt they had experienced more bad luck than usual, significantly more often than the Well group ($X^2 = 6.36$; $df = 1$; $p < .02$) and the Control group ($X^2 = 7.25$; $df = 1$; $p < .01$).

The social worker's interviews for the Sick, Well, and Control groups were searched for special, important events in the Ss' lives. Both those that seemed negative, as well as those that seemed positive or equivocal were noted. The judge was not aware of S's diagnostic status. Table 2 presents a complete listing of all these items for each subject.

Insert Table 2 about here

The number of subjects with at least one event occurring before breakdown, during the year of breakdown, and following breakdown were counted for the Sick group, and for the matched Well and Control groups. The age at which each Sick subject suffered psychiatric breakdown was used as "year-of-breakdown" for their matched Well and Control subjects. Breakdown for the subject was considered to have occurred at the time of first admission to a psychiatric hospital, first criminal conviction, or earliest psychiatric diagnosis. After agreement on criteria, two independent judges concurred completely on the identification of significant events.

The number of subjects experiencing significant events preceding or during the year of breakdown for the Sick, Well, and Control groups, respectively, was 8, 8, and 9. Of these, the number judged to be negative were 6 for the Sick group, 5 for the Well group, and 5 for the Control group.

Table 2
Control Subjects

Number	Age	Events Preceding Breakdown	Events Year of Breakdown	Events After Breakdown
62B	18	None Reported	None Reported	None Reported
72C	19	Mother died (judged negative)	None Reported	None Reported
97C	10	None Reported	None Reported	None Reported
95A	20	Left school after 8th grade (judged equivocal)	None Reported	Entered the army (judged equivocal) Lived with fiancée (judged equivocal)
64A	18	Mother died (judged negative)	None Reported	None Reported
89B	16	None Reported	None Reported	None Reported
36C	12	None Reported	None Reported	None Reported
61C	14	None Reported	Left school after 7th grade (judged equivocal) Was hospitalized (judged negative)	None Reported
23A	12	None Reported	None Reported	None Reported
28E	17	None Reported	None Reported	None Reported
75A	10	None Reported	None Reported	Father became seriously ill (judged negative)
63A	21	None Reported	None Reported	None Reported
2B	22	None Reported	None Reported	None Reported
11E	18	None Reported	None Reported	None Reported
17B	18	Was hospitalized (judged negative)	None Reported	None Reported

(Table continued on next page.)

Table 2, continued

Number	Age	Events Preceding Breakdown	Events Year of Breakdown	Events After Breakdown
26A	17	None Reported	None Reported	None Reported
46C	18	Left school after 8th grade (judged equivocal) Was unemployed for 5 months (judged negative)	None Reported	None Reported
92C	18	None Reported	None Reported	None Reported
97B	18	Father re-married (judged equivocal)	None Reported	None Reported
65B	21	Entered the army (judged equivocal)	None Reported	None Reported
<u>"Well" Subjects</u>				
200A	18	None Reported	None Reported	Entered the army (judged equivocal)
98A	19	Lost contact with father (judged negative) Mother died (judged negative) Learned that he was diabetic (judged negative)	None Reported	None Reported
69B	10	None Reported	None Reported	None Reported
19A	20	Got married (judged equivocal) Wife became pregnant (judged equivocal)	Entered the army (judged equivocal)	None Reported
143A	18	None Reported	None Reported	None Reported
9B	16	None Reported	None Reported	None Reported
90A	12	None Reported	None Reported	None Reported

(Table continued on next page.)

Table 2, continued

Number	Age	Events Preceding Breakdown	Events Year of Breakdown	Events After Breakdown
131B	14	None Reported	Mother was hospitalized after a traffic accident (judged negative)	None Reported
16E	12	None Reported	None Reported	Father did not attend his confirmation ceremony (judged negative)
212B	21	Left before completing higher education (judged equivocal)	None Reported	None Reported
160A	10	None Reported	None Reported	None Reported
109A	21	None Reported	None Reported	None Reported
16B	22	None Reported	None Reported	None Reported
31C	18	Left school after 9th grade (judged equivocal)	Became pregnant (judged equivocal) Was threatened with loss of job because of pregnancy (judged negative) Family was not supportive during pregnancy (judged negative)	None Reported
7B	18	None Reported	None Reported	None Reported
148A	17	None Reported	None Reported	None Reported
3B	18	Father committed suicide (judged negative)	None Reported	Was twice denied admission to higher education (judged negative)
36B	18	None Reported	None Reported	None Reported
175A	18	Was expelled from school (judged negative)	None Reported	None Reported

(Table continued on next page.)

Table 2, continued

Number	Age	Events Preceding Breakdown	Events Year of Breakdown	Events After Breakdown
4B	21	None Reported	None Reported	None Reported
<u>"Sick" Subjects</u>				
30A	18	None Reported	None Reported	None Reported
144A	19	None Reported	Stole from his employer (judged negative)	None Reported
134C	10	None Reported	None Reported	None Reported
20B	20	None Reported	None Reported	None Reported
38A	18	None Reported	None Reported	None Reported
104A	16	None Reported	None Reported	None Reported
148B	12	Was beaten by a teacher (judged negative)	None Reported	None Reported
176B	14	None Reported	None Reported	None Reported
208B	12	None Reported	None Reported	Mother hospitalized (judged negative) Baby brother hospitalized (judged negative)
114B	21	Entered the army (judged equivocal) Parents became divorced (judged negative)	None Reported	None Reported
15B	10	None Reported	None Reported	Tried twice to run away from his childrens' home. Stole money from his grandmother. Mother was run over by a train. Father prevented him from seeing his uncle. Lost contact with his father. Received no birthday greetings on his birth- day (all judged negative)

(Table continued on next page.)

Table 2, continued

Number	Age	Events Preceding Breakdown	Events Year of Breakdown	Events After Breakdown
32A	21	None Reported	Did civilian work as as a Conscientious Objector (judged equivocal)	None Reported
16A	23	None Reported	Became pregnant (judged equivocal) Fiancé had an affair (judged negative) Called off her wedding (judged negative) Delivered her baby 3 weeks early (judged negative)	Got married (judged positive/ equivocal) Began pulling her hair out (judged negative)
155B	18	Left school after the 7th grade (judged equivocal)	None Reported	None Reported
18B	18	Tried to run away from a children's home (judged negative) Was beaten by her mother (judged negative)	None Reported	Lost her boyfriend (judged negative)
58C	17	None Reported	None Reported	None Reported
120A	18	None Reported	None Reported	None Reported
108C	18	None Reported	None Reported	None Reported
74A	18	Left school after the 7th grade (judged equivocal) Father didn't answer his letters (judged negative) Lived with aunt and uncle because of father's illness (judged negative)	None Reported	None Reported
46A	21	None Reported	None Reported	None Reported

Discussion

High-Risk Versus Low-Risk Group Findings

While there were few significant findings in the comparison of the high- and low-risk groups, those that were significant were in agreement with those of Fleming (1966), Fleming and Ricks (1970), and Ricks and Berry (1970), suggesting that in general the high-risk group experiences what might be characterized as a "failure" lifestyle. The feelings of isolation, alienation, and unacceptability reported by Fleming (1966) in her preschizophrenic sample is paralleled by our high-risk group, which, in general, reports poor interpersonal relations, or none at all. Teachers' reports on preschizophrenics and on these same high-risk Ss confirm their poor peer relationships (Roff, 1970; Mednick and Schulsinger, 1968b). Fleming (1966) reported "feelings of vulnerability" in her preschizophrenics; i.e., they felt that the world was unfair to them. This is true of our high-risk group in that they feel they have suffered more bad luck than usual.

Most importantly, Fleming (1966) found that preschizophrenics report high and ever-present anxiety which is not confined to any specific context. Our high-risk group reported similar feelings in this interview. In an earlier report on this same high-risk sample Mednick and Schulsinger (1968b) found psychophysiological evidence of high arousal and slow habituation to aversive stimuli. We can, perhaps, understand the high-risk group's feeling of anxiety in terms of this psychophysiology. Easily aroused anxiety and slow habituation would, perhaps, produce feelings of constant and diffuse anxiety.

Sick Versus Well Versus Control Group Findings

We find no evidence that anything that might be interpreted as "precipitating events" are more common in the Sick Group than in the two control groups. A count of the number of subjects who report such experiences, both before and after breakdown, does not statistically differentiate the groups. Thus the types of premorbid "events" we have examined offer us no explanation as to why some children of schizophrenic mothers break down and others do not. These results are similar to those of Hudgens, Morrison, and Bacchia (1967). Their retrospective study of 40 patients hospitalized for affective disorders found that generally the number of significant events experienced by the patients in the year of and the year preceding the onset of the illness did not differ significantly from chance. The two events that the patients experienced significantly more often than the controls were change of domicile and interpersonal conflict. However, most of the changes of residence, while taking place in the year of the onset of illness, occurred after the onset of the disorder.

The results of Brown and Birley's (1968) study of life changes preceding the onset of schizophrenia may be seen as being in conflict with ours. They interviewed 50 hospitalized schizophrenics and their relatives to obtain the time of occurrence of a predetermined list of significant events. They found that in the 13-week period prior to the onset of schizophrenia, the patients experienced double the number of significant events as compared with control subjects. They also found that 46% of the patients experienced at least one significant event in the three weeks preceding the onset of the illness. As Brown and Birley (1968) point out, certain methodological features

in this study must be taken into account in interpreting the results. To begin with, the experimental and control groups were not treated equally. Whereas a relative of each of the schizophrenic patients was interviewed to confirm his report and supply any of the patient's omissions, the control subject alone was interviewed. While many types of events which a control subject reported could be verified (e.g., his wedding date), his omissions were lost to the study. In addition, since the interviewers were not "blind," the problem of experimenter bias in the interview is a possible consideration. In comparison to the works of Brown and Birley (1968) and Hudgens, Morrison, and Barchia (1967), we can cite certain advantages of method in the present study. The interview upon which this study is based was completed before the Ss were judged as being "Sick." This probably minimized the contamination of the interview by the diagnosis. The previous research has been retrospective. We should also note that the Sick, Well, and Control groups are matched for age, sex, social class, and psychological adjustment in 1962. These variables are not likely to have been important in producing differences in the probability of experiencing significant events between our groups.

On the other hand, it is important to indicate that there are gross diagnostic differences between this study and the other two. Brown and Birley (1968) interviewed hospitalized schizophrenics, while Hudgens, Morrison, and Barchia worked with hospitalized manic depressives. Most of our subjects were not in the hospital at the time of the interview. Only about two-thirds of them had ever been hospitalized, and some of those only for diagnostic purposes. Because of the bewildering array of possible motives influencing the responses of a subject or his relative to this kind of interview as a function of diagnosis and/or hospitalization, it is not possible for the author

to judge the role that these methodological differences may have played in producing the differences in results. The Brown and Birley (1968) subjects averaged 33.8 years; the Hudgens, Morrison, and Barchia (1967) were 44.8 years of age. Our subjects had a mean age of 17.9 years. What is a significant event is quite different for a 17-year-old and a mature adult of 42 years.

An additional important point to consider is the fact that our social worker interview was not designed with this study in mind. Consequently, many events may not have been ascertained in this interview since direct probes for this type of event were not used.

Our results do not imply that there is not an important environmental effect in the etiology of psychiatric breakdown, or even that there are no precipitating circumstances. We can only generalize our findings to the types of events we noted; it may be that the critical events for these young subjects are of a more subtle, interpersonal nature.

The data may also be interpreted as indicating a special vulnerability in the Sick subject. Perhaps it takes less stress to precipitate a breakdown in these individuals. It is also possible that they need only a small misfortune to begin a spiral of feelings of distress, increasing perceived misfortune, which in turn leads to increase of feelings of distress, etc.

Post Script

The high- and low-risk groups investigated in this study are now being re-tested. Although the testing is not yet complete, it is clear that the heterogeneous Sick group is no longer so sick, nor is the Well group free of psychopathology. It is likely that the subjects

who now appear to be having psychiatric difficulties are manifesting more serious psychopathology than the Sick group studied here -- they are older now, and well past the upheavals of adolescence. It will be interesting to see whether precipitating events will be discernible in the breakdown of the new Sick subjects.

Appendix B

Social ClassesSocial
ClassMeaning

- | | |
|---|---|
| 0 | Unskilled worker. E.g., factory worker, maid, agricultural laborer. |
| 1 | Basically unskilled worker, but in a position of some responsibility. E.g., truck driver, waiter, small shopkeeper. |
| 2 | Skilled worker. E.g., carpenter, mailman. |
| 3 | Subordinate clerk. E.g., salesman, proofreader. |
| 4 | Skilled handworker with own business. E.g., grocer, barber. A policeman and a social worker in Denmark would be in this social class, too. |
| 5 | Leaders or owners of small - medium sized businesses. Non-academic professions are in this social class. E.g., hotel proprietor, elementary school teacher, musician. |
| 6 | Academic occupations; any profession requiring a theoretical examination after five years or more of post-high school education. E.g., engineer, high school teacher. |
| 7 | Advanced positions in business or the professions. E.g., physician with a large practice, chief of police, professor. |

